Resto 430 Study Review

Occlusal Appliances

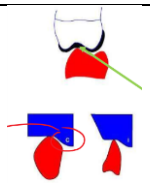
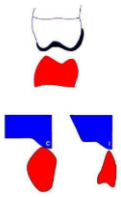
= Any removable artificial occlusal surface affecting the relationship of the mandible to the maxilla

Uses	TMD and Bruxism Tx -> However it's likely a placebo effect - Doesn't actually stop bruxism, but still protects the teeth - ↑ VDO - Provides Bilateral Stable contacts = a stable platform for clenching and swallowing, distributing the load on the TMJ's. - Prevents parafunctional habits that are developed to find a stable occlusion
Options	Stabilization Appliance - Most Common - Often for the Maxilla Anterior Repositioning - Used for Sleep Apnea Anterior Bite Planes (NTI) - Only biting in the front -> Posterior Bite Planes (Dahl) Pivot Appliances Soft Appliances 
Issues	Anterior Repositioning Devices - Can result in a significant splaying of teeth Anterior / Posterior Bite planes - Can result in uncontrolled supraeruption of unopposed teeth with long term use Pivot Appliance - Can impact the TMJ -> Creates unwanted downward translation or upward joint compression Soft Appliances - Can create stimulus for ↑ frequency of clenching -> Maxes Bruxism worse Stabilization Appliance - Not too bad 😊 This is why we love it

Stabilization Appliance

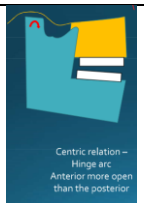
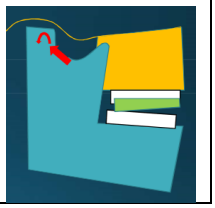
Requirements	Usually covers the Maxillary Teeth - Smooth and doesn't impinge on soft tissues - Complete occlusal coverage -> Cusps from mandible will contact on a flat splint surface Anterior Guidance achieved with canine ramps  Made of Heat or Cold cured acrylic -> The harder the better, prevents pulsating clenching *Retention:* - "Snap" retention from buccal embrasures - Can add clasps if needed
Occlusal Contacts	

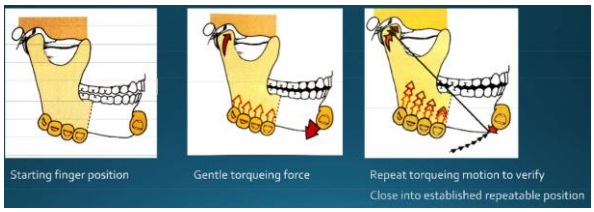
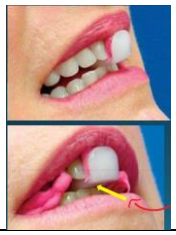
2 Cusp Contact	Single Contact
- Most stable, prevents tooth movement - Hard to achieve with malpositioned teeth - Narrows the tongue space (thicker on the palatal)	- Easier to achieve - Minimal palatal extension - Allows for movement of mandibular teeth

	Centric Position - Recess the cusp tips of the opposing into a flat plane area -> This prevents excessive bite raising - Ideally ½ way between full anatomy and full flat - Create canine and anterior ramping to create posterior disclussion   ➔ Looking for dots everywhere even during centric position **Posterior Disclusion** - Ramping the anteriors and canine opens up the posterior bite and prevents any interferences  ➔ Looking for lines in the anteriors and nothing in the posteriors during excursions to show posteriors are discluding  **Don't make ramps too steep, or the mandibular teeth will become locked behind the appliance**

Fabrication	1. Assess for interferences
	2. Alginate impression and models made
	3. Interocclusal Registration -> At the vertical dimension intended for appliance (2-3mm) and in CR
	4. Mount casts with interocclusal registration
	5. Appliance is drawn on and waxed on cast
	  - Extended 10mm past palatal gingival margins
	  - Buccal extension into the embrasures and just over the HOC, or approx. 30% of crown
	  - Smooth occlusal surface
	 
	6. Casts are invested -> Wax is boiled out and heat cured acrylic resin is applied into the void
	7. Appliance is smoothed and polished for Delivery
	8. Anterior ramps are added
	  - Usually only added if suspect TMD or muscle myalgia to cause relaxation of muscles. If you are protecting from bruxism or restos don't usually need them.

Jaw Relation Record

Criteria	- Occlusal contacts centered on registration material - Repeatable Position -> CR - Adequate thickness for appliance -> 2-3mm posterior opening *Don't take the bite reg too hard. Really just need the tips of the cusps. There should be 2-3mm of wax on your bit reg.*
Materials	Requirements: - Soft enough to prevent jaw deflection - Must set rigidly and not distort **Brown Wax is the most rigid and stable when cooled down ** 
Centric Relation	 = Condyles articulate in the Superior-anterior position against the anterior slopes of the eminence - Arch is independent of tooth contacts and is a repeatable position If you screw up:  *Postured Position (Habitual bite):* - Translated Condyle in protrusion causes the posterior to be more open than the anterior - Appliances made in this position may prevent the condyle from seating = creates joint problems and instability 

	Methods: *Dawson Method (Preferred)* - Fingers placed along the body of the mandible, Thumbs on the Menton -> Apply a downward pressure on the menton and a backward pressure behind the angle   Repeat motion until it closes the same each time. Then do it one last time with recording medium and measure the 1st contact *Deprogamming* -> Usually an adjunct to Dawson to remove the "memory of habitual ICP" before using Dawson - Lucia Jig, Cotton Roll, Leaf Gauge  By making someone bite only on the anteriors (or on something that prevents full intercuspation), the muscles deprogram from their habitual pattern used to find ICP For Lucia Jig: Mark the jig with articulating paper -> This is a static CR - Then apply futar to the teeth and close back on the same articulator mark
Mounting Mandibular Cast	*Max Cast:* - This is still mounted using a facebow like normal *Mand Cast:* - Place the Jaw relation record in place (should open the bite by 2-3mm) - Set the pin to zero -> It will not hit the base, and maintain the 2-3mm space for the appliance 

Lab Prescription

"Please fabricate a 2mm thick Maxillary stabilization splint using clear hard acrylic. Include an anterior ramp to disclude the posteriors in excursion"

Thank You

Things to Include:

What You are Making: Michigan Splint, Stabilization Splint, Anterior Repositioning Splint, NTI etc

Which Arch: Max, Mand

Material: Acrylic

Hardness: Hard/Soft

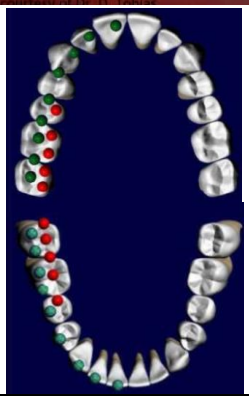
Thickness: ___mm

Canine Rise: Include / Don't include

Occlusal Schemes

Morphologic Goals in Occlusal Rehab.

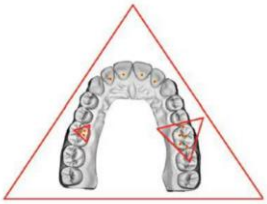
1. Establish stable reproducible **mandibular position** (ICP Vs. CR)
2. Establish **Occlusal Plane** for functional and esthetic considerations (Smile Line)
3. Design of Static Occlusion (**Occlusal contacts** when maxilla and mandible intercuspate)
    - Tooth contact, Tooth anatomy, Marginal ridge heights, Root angulation, Parallelism, Contact distribution etc
4. Design of dynamic occlusion (**Occlusal Guidance**)
    - Anterior guidance Vs. Groups function, Mutual protection, Atraumatic occlusion

Mandibular Position	 Looking for the **disk** to be in the posterior-superior location, between the condyle and the posterior slope of the articular eminence (Centric Relation) - Bi-manual manipulation (Dawson) Method is recommended
Occlusal Plane (Antero-Posterior Cant)	Reference: Line connecting the Upper anterior incisal edges, Canine Cusp tips, and Buccal cusps - Should follow the same curve of the lower lip for esthetics  - Biting force and masticatory efficiency is affected by steepness of the occlusal plane in relation to the muscles of mastication -> But the planes relation to esthetics is usually more significant in natural dentition than function - Steep curves facilitate a pronounced OJ and OB -> leading to posterior disclussion and anterior guidance
Inter-Occlusal Contacts	Cusp-Fossa OR Cusp-marginal ridge contacts (Cusp-Embrasure Occlusions) are common in natural dentition - Cusp Ridge-Occlusion is most common and easier to create. Cusp-fossa requires a lot of rehabilitative work to create  *Evidence is lacking for only Cusp Fossa occlusal contacts as being the best occlusion for optimizing axial forces on teeth, preventing food impaction and ↓ lateral forces on posterior teeth* -> It's all a lie!  We can see a Combo of both Cusp-Fossa and Cusp-Embrasure occlusions - This is chill as long as the contacts are distributed evenly across the arch - Mutual protection = Heavier contacts in the molars vs on the anterior
Dynamic Occlusal Guidance	Canine Guidance is preferred for mand. tooth guided movements (Vs. Group Function) - There are no real studies saying which is better though - ↓ posterior wear potential with canine rise - Canine rise is easier to produce and easier to create better occlusal rehab with ***Mutual Protection*** = Anterior guidance disccludes the posterior teeth during dynamic movement
Occlusal Vertical Dimension and Occlusal Support	- ↓ masticatory efficiency with ↓ posterior contacts -> This may be more subjective than objective - If Pt is complaining about eating their food (and they have 5-5) then dentures probably wont change much. -> Inform Pt of this - No definitive evidence that Pt's lacking posterior teeth develop TMD

Occlusal Anatomy of Prosthetic Teeth *Anatomic form seems to be preferred by patients mostly on esthetics…they don't seem to have any functional superiority over flat*	
Natural Form - **Anatomic**	Highly anatomic denture teeth may cause instability in occlusion during chewing and can cause more damage than good. 
Anatoline Form - **Semi anatomic**	Shallower Anatomy -> Leads to more stability in excursive movements 
Monoplane Teeth - **Non-anatomic**	Completely Flat occlusion - Useful for X-bite situations - Easier to manage in reverse lingualized occlusions 
Occlusal Schemes	
Lingualized Anatomic	Single Contacts on molars Exaggerated Curve of Wilson *Easy! You only have to balance 1 contact as opposed to 2 per tooth* 
Protrusive and Cross arch Balance	Promoted by compensating curves (Flatten curves of Spee) - Need balanced contact Anterior-Posteriorly and laterally on excursive movement in order to ↓ posterior stress that will unsuction the denture Idea is that during protrusive movement anteriors AND posteriors remain in contact and this avoids cantilevering the denture off 

Classification of Tooth Breakdown and Remaining Tooth Arrangements	
Type I	Ideal and minimally compromised - Little adjunctive therapy needed - Pathology affecting the clinical crown of select teeth (< 3 in a sextant) - No pre-prosthetic therapy needed - Contiguous dental arch 
Type II	Moderately Compromised - Anterior guidance is intact or can be maintained - Only localized adjunctive therapy required pre-prosthetically - Clinical crown pathology affecting no more than 4 teeth in a sextant - Breakdown found in no more than 2 sextants 
Type III	Substantially Compromised - Occlusal scheme requires major therapy without a change in OVD - Clinical crowns compromised in structure in minimum 3 sextants, involving no more than 4 teeth in each sextant - Teeth require adjunctive therapy in at least 2 sextants  
Type IV	Severely Compromised - Insufficient tooth structure to retain or support resto's in 4+ sextants - Adjunctive therapy required in 3 + sextants - Major therapy required to re-establish occlusal scheme (Including potential VDO change) 

Occlusal Registration in Pros

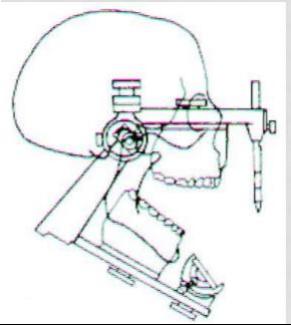
Intercuspal Position	= Maximum interdigitation of Max and Mand teeth - A uniquely stable position between the Max and Mand - Determined by the **teeth** Typically the position of choice for restorative dentistry **No occlusal record is needed if you are mounting in ICP**  Nicely stable….so none of this is needed -> 
Indications for Occlusal Records	- Occlusal instability in ICP - Lack of arch tripodization - CR record is desired - OVD change is planned - Partial or Complete edentulism  ➔ Habitual ICP with an anterior open bite! This isn't nice tripodization is it? NO Bust out that futar or wax and do a registration
Tripodization	= Need a tripod of 3 points of contact around the arch to be stable: - 2 bilateral posterior contacts and at least 1 anterior contact ***As long as you have a tripod, you don't need to record (providing you are working with ICP)*** - If you are missing a part of the tripod, then you only need to record that missing piece -> Anterior open bite? Only register the anterior   ➔ Make sure you can see the teeth you are capturing. Don't be a wasteful Wendy.

Lets Play a Game

Clinical Case	Do we need occlusal record?
 Single unit Veneer <- Implant Crown -> 	*No record needed* - These are both Max. anterior teeth that are not intercuspated in ICP. So an ICP record would be unnecessary *Do we need protrusive record?* - That's a little more relevant here, but we still don't need it because the 21 can give us that information
 Posterior single unit crown	*NOPE* - Its not really shown here, but we can assume there is stable tripodisation - Also this tooth is not involved dynamic guidance (group function) because Canine Rise is boss and discludes it so we good
 3 unit Bridge (Posterior)	*Nuh Uh* - Canine Rise is intact still (but we still want to use articulator to protect posterior occlusion w/ lateral excursions on the canine) - We have stable tripod using the 7, and then anterior and the other side

 4 occluding Posterior Crowns?	*Yah you probabl yshould*   - Only need 1 posterior stop, no need to futar all over everything. This captures how the posterior occludes and tells us how much space each crown needs to occlude nicely
	Sequential MCC Preps - Only 1 Occlusal Registration is needed. - Register the 17 to create the "Tripod" then make provisionals for 15 and 16 to then maintain that occlusion to ensure the VDO doesn't change  

Articulators

What are they?	= Mechanical instrument that represents the TMJ and Jaws. Mount Max and Mand casts to it to simulate some or all mandibular movements - Not 100% representative because in articulator the Maxilla is what is moving, but in Pt the mandible is moving  ……also this is terrifying
5 Elements Of Articulators	1. Horizontal Axis of rotation (A hinge) 2. Condylar Inclination and Fossa components 3. Intercondylar Distance 4. Bennet Angle and Medial Wall 5. Incisal Guidance *Articulators can have some, or all, or any combination of these depending on the model and how wild it is*
Uses of Articulator	*Occlusion*: - Re-create the static occlusal contacts between Max and Mand teeth on casts *Articulation*: - Simulate the dynamic tooth contacts during excursive movements *Simulation*: - Simulate the mandibular movements *Diagnostic*: - Help create proper diagnosis to plan Tx accurately - ↑ visualization of tooth relationships - Easier to assess mandibular movements *Tx Planning*: - Aesthetic and Functional Wax Ups - Orthodontic Setups - Designing Fixed restorations *In Treatment*: - Aids in developing Restorations that are in occlusal harmony

Classes of Articulators

Class I – Simple Hinge

Class I – Modified Hinge

Class II – Average Value

- Non-Adjustable
- Fixed condylar inclination and Bennett Angle
- Movement is unrelated to patient movement
- Slightly more adjustments (VDO, but not condyle adjustments)

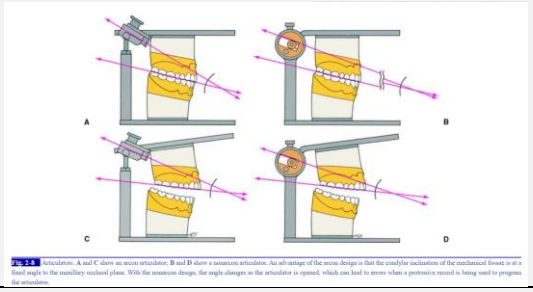
Class III – Semi Adjustable

Allows compensation for:

- Protrusion
- Articular Eminence (condylar) inclination
- Bennet Angle
- Immediate side shift
- Accepts Facebow registration

Fixed intercondylar width of *110mm*

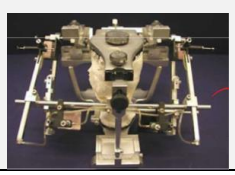
Arcon (Articulating Condyle)	**Non-Arcon** (Non-Articulating Condyle)
Ball Bearing on lower member - Condylar element on the lower member - Condylar guidance is on the upper (Like a TMJ) - Angle of articulator NEVER changes when we change the VDO	Ball Bearing on the upper membrane - Angle of articulator changes when we change the VDO ☹ - Condylar element on the Upper - Condylar guidance is on the lower



Exam: Know the difference between these two types and what is adjustable

Type IV – Fully Adjustable

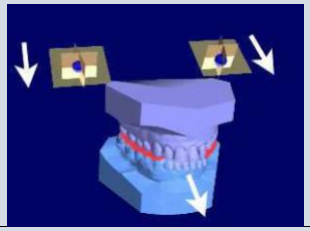
- Allows for all programming options we see with Class III + Extra-oral tracings and intercondylar width modifications



Programming Semi Adjustable' s

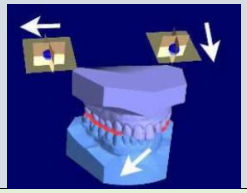
Protrusive Jaw Relation Record

- Static registration of condylar relationship
- Condylar housing knobs are loosened
- Casts are Stabilized on protrusive record
- Condylar housings are rotated until they contact the ball -> Establishes an "Articular Fossa" inclination




Lateroprotrusive JRR

- Static registration of ISS, PSS/Bennett Angle
- Rotation of working condyle
- Downward and inward translation of non-working condyle
- Adjust condylar guides for PSS/Bennett angle




Accepted Average Values:

- *Intercondylar Distance*: 110mm (Fixed)
- *Immediate Side Shift*: 0.2mm
- *Progressive Side Shift*: 7° -> Bennett Angle
- *Incisal Guidance*: Reproduce existing
- *Condylar Inclination*: 20-30° -> Incisal pin 5-10° steeper

Facebows

= Used to register the 3D position and orientation of Max. dentition relative to the craniofacial anatomy -> We then use this to mount the maxillary cast in a similar position within the articulator

- Provides an approximate measurement of intercondylar distance
- If you want a TRUE hinge axis you need to use a Kinematic facebow, otherwise it's an arbitrary facebow that we use

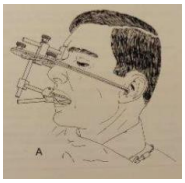
Arbitrary Facebow

- Uses 2 posterior reference points (External Auditory Meatuses's) to create the transverse horizontal axis and an anterior reference point (Nasion)

Limit the OVD changes to ≤ 2mm if using the Arbitrary hinge axis. If >2mm need to use the True hinge axis and mount at the new OVD

Advantages:

- Simple to use and faster
- Doesn't require repeated measurements
- Doesn't require marks on the patients face
- Reasonably accurate

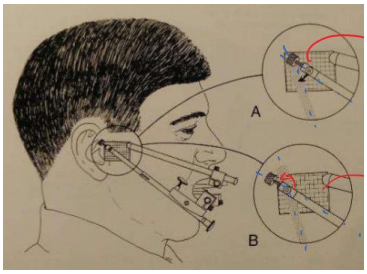


Indications:

- Single resto's
- Multiple Resto's (LOL)
- Bridges
- Most removable protheses

Kinematic Facebow

- Used to determine the true hinge axis (the actual location of the condyles instead of the "ish" location)



As mandible moves it will draw a line on a grid. If there is a line drawn, it indicates that there is translational movement = NOT true hinge axis. Adjust the position until there is no line drawn = pure rotational hinge movement

Watch how the lower arm moves relative to the grid. If the arm moves in any way other than rotational it is not on the condyle

Indications:

- Full mouth reconstruction
- Extensive occlusal pathology
- Multiple resto's in opposing quads

Condylar Inclination

- Occlusal morphology is affected by the set condylar inclination
- If the condylar angle is too large = Steep cuspal inclines, creating potential interferences
- If condylar angle is too small = shallower inclines.
  - Better to aire on this side so you get disclussion on protrusion/excursions and not interference

Time for another game!

Case	Which type of Articulator do you need?
Failed MODBL amalgam w/ ML cusp fracture on 46 - Tx plan: Full coverage crown 	Semi-Adjustable is ideal - Could get by with simple hinge though
Missing right maxillary central incisor (11) and Intra-osseous implant - Tx Plan: Implant Crown 	Semi-Adjustable is ideal - Needs to be able to protrude (a modified hinge might work also)
Missing R. Max. 1st premolar (#14) - Tx Plan: 3-unit bridge supported by abutments on 15 and 16 	Semi-Adjustable once again! - A modified hinge wold be the bare miminum though
Missing L. Max. Lateral incisor (22) and first premolar (24) - Tx Plan: 5 unit bridge w/ cast post and core on 21 and 23 	Semi-Adjustable is the minimum - Need to be able to reproduce all possible lateroprotrusive movements
Full-veneer prep for Left mandibular Central incisor crown (31) - Tx Plan: Porcelain crown 	Don't really need anything….but you could use a modified hinge as a minimum
7 full veneer crowns 13-24 - Tx Plan: Porcelain crowns 	Semi-Adjustable is the minimum - Need excursive movements
Missing Left Mandibular 1st molar and intra-osseous implant - Tx Plan: Implant supported crown 	Apparently nothing?
Wax-up for Maxillary complete denture and opposing Mandibular partial 	Semi-Adjustable

….So here is basically everything you have read in a 38min video -> https://www.youtube.com/watch?v=0FL4KBfLlJg

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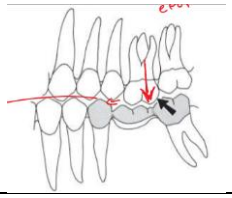
FDP Connectors & Pontics

Causes of tooth loss	- Caries - Periodontal Disease - Trauma - Congenital Defects - Oral Cancer - Iatrogenic

Consequences of Tooth Loss	- Esthetics
	- Phonetics
	- Mastication
	- Tooth Movement (Drifting, Tipping, Rotation, Extrusion)
	  - <25 years old = 10% ↑ in tooth movement
	  - Creates problems with: Esthetics, ↓ VDO, Occlusal changes, Food impaction
	 
	Supraeruption happened before bridge was made. So nowwww with the new occlusion you are going to have issues with excursive interference.

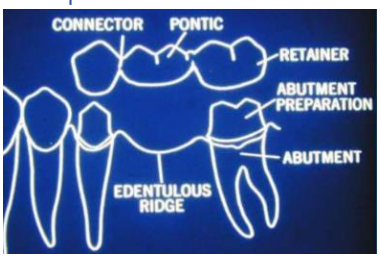
Tx Options	No Tx Ortho Tx - Close the space Prosthodontic Tx - Fixed Dental Prosthesis (bridge) - Removable Dental Prosthesis - Implant Prosthesis

Fixed Dental Prosthesis AKA Fixed Partial Denture

	PRDP	FDP
Advantages	- Cheaper - Multiple edentulous areas can be fixed with 1 prosthesis - Can design as a distal free end - Can prosthetically replace gingiva, Mucosa, and Residual Ridge - Immediate prosthesis - Load distribution is better - Oral hygiene is easier to achieve	- Pt Acceptance - Esthetics - More comfortable - Can act as a periodontal splint to hold mobile teeth together

FDP	
Strength	**Depends on a number of factors**: *Material* - Metal vs All ceramic - Metal is more ductile than zirconia (which is quite brittle) so usually metal is the best option *Edentulous Span* - Number of pontics *Esthetics* - Material and cutbacks *Connectors* - Metal vs all ceramic
Survival	Approx 75% survival rate after 15 yrs *Reasons for Failure:* - #1 is Caries - Retention loss (Perio involved teeth etc) - Tooth Fracture

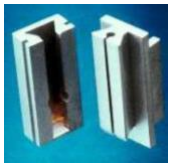
Components:



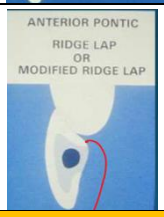
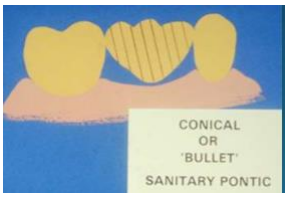
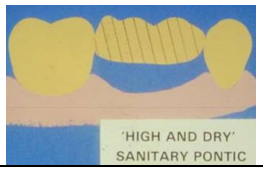
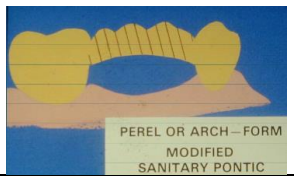
Abutment	Real Tooth that is acting as a support
Retainer	The Crown that goes on the Abutment

Pontic	*Function*:
	- Esthetics
	- Mastication
	- Speech
	Material Options:
	- Metal
	- Metal Ceramic
	- Ceramic
	  - Lithium Disilicate is brittle, Zirconia takes forever to adjust…Not a great option
	- Lab Processed Composite Resin
	- Direct Acrylic or Composite Resin (Fiber-Reinforced)
	  - Longer Term transitional used for iffy teeth or old patients
	Oral Hygiene:
	- Embrasure Space
	  - Usually a bit more open than usual to make flossing underneath easier
	- Tissue Contact
	  - Firm but not too much, need to be able to easily floss under the pontic

Connector	Joins the retainer to the pontic *Attachment* = Key sticking out of the pontic to act as a stress breaker (Distal Half of retainer) - Help achieve parallelism - Aid in long span FPD's

Precision Attachment (Pre Made)	Semi-Precision Attachment (Cast)
↑ Precision Manufacturing ↓ Movement 	↓ Precision ↑ Movement -> Helps Stress breaking though 😊 
Risks of Attachments	Inadequate root dimensions Inadequate Prosthetic dimensions Inadequate C:R Ratio Mobile Abutment Teeth
Complications	↑ Tx and Lab. Complexity ↑ time and cost ↑ maintenance

Pontic Design

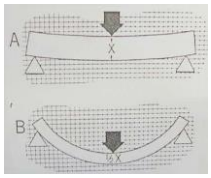
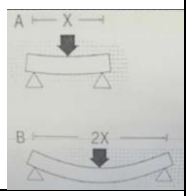
Anterior Pontics	
Ovate	 - Most esthetic option - Hardest to clean (Tissue almost grows around it)
Ridge Lap/Modified Ridge Lap	 - Lingual is opened up along the gingiva -> Makes it easier to clean with a sulca brush
Posterior Pontics	
Conventional	 - Sits off the gingiva to allow for floss to clean underneath
Conical/"Bullet"	- Gingival embrasures opened up more to make it easier to pass floss through (Good option for those with dexterity issues or very posterior pontics)  
High and Dry	- Easiest to clean -> Miles away from the ridge - Looks terrible and weird -> Function >> Esthetics  
Perel/Arch Form	 
Modified Ridge Lap	 -Esthetically looks the best -Hardest to clean

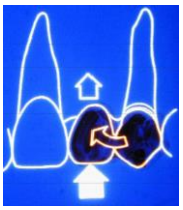
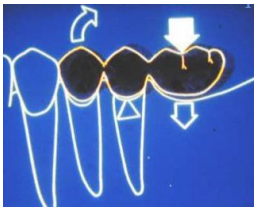
How to create a provisional in clinic

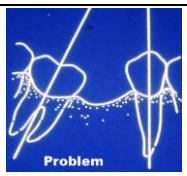
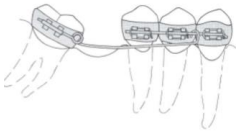
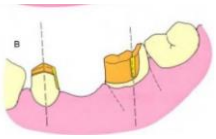
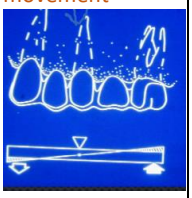
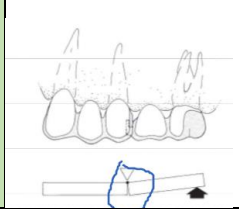
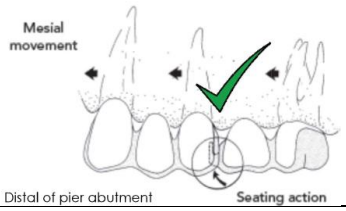
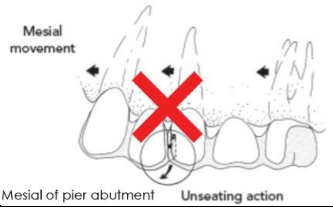
1. Take impression of both the edentulous space and the opposing
2. Pour cast
3. Wax-up a pontic
4. Articulate the 2 arches
5. Take an impression of the wax-up
6. Pour up
7. Make a Vacuform matrix -> now you can do your shit

FDP Biomechanics

<table>
<tr><th colspan="2">Considerations</th></tr>
<tr><td>Abutment Teeth</td><td>Periodontal Support and Structural Integrity
- <u>Crown:Root Ratio</u>
- 1:2 = Ideal
- 2:3 = Good
- 1:1 – Minimum
- <u>Root Configuration</u>
- NO Round roots
- NO Convergent roots
- Multiple, ovoid, divergent roots is best
- Want long roots as well

General guideline: “The Periodontal surface area of the proposed abutments should be greater than that of the teeth to be replaced – Ante’s Law”</td></tr>
<tr><td>FDP Strength</td><td>Deflection
- Varies directly with the length of the pontic space -> a 2 pontic bridge bends 8x more than single pontic space (x^3)
- Varies indirectly with occlusogingival thickness (and buccolingual, but O-G is more important) -> ↓ thickness of pontic or connector by ½ results in bridge that bends 8x as much under the same load
   </td></tr>
<tr><td>Occlusion</td><td></td></tr>
<tr><th colspan="2">Special Circumstances</th></tr>
<tr><td>Double Abutting</td><td> 
Pros:
- ↑ support for poor Perio teeth (poor C:R ratio)
- ↑ distribution of forces

Cons:
- Harder for Patient to clean around the extra abutments
- Much more challenging to prep, all abutments must have the exact same draw and be parallel
<u>Criteria:</u>
- 2º abutment has at least equal root S.A. and equally favorable C:R as 1º abutment
- Retainer on 2º abutment must be at least as retentive as retainers on 1º
- Sufficient crown length to prevent gingival impingement under the connector</td></tr>
<tr><td>Centilevered FDP</td><td><u>Criteria</u>:
- Healthy Abutments
- Good C:R Ratio
- Ante’s Law must be achieved
- ↓ Occlusal Force
<u>If you go for it:</u>
- ↓ Occlusal table and tooth size -> This could look strange
- Create Light centric contact
- Limit excursive Contact
- NO Distal Cantilevers -> Terminal Abutments act as a pivot = Gets overloaded, opens margins and creates leakage
 
 
BAD</td></tr>
</table>

Tilted Abutments	***Considerations***: - Path of Insertion - Tooth Prep - Non-Axial-loading  ***Solutions***: - Orthodontic Up-righting  - Proximal ½ Crown  - Telescoping Retainer  - Non-Rigid Connectors
Pier Abutments	= Middle/Intermediate Abutment - Receive ↑ stress -> Use a non-rigid connector (Stress Breaker) to ↓ the stress = Interlocking pieces - Place the stress breaker on the **distal of the intermediate abutment**. Allows mesial movement under occlusion to seat the connector  Stress Breaker -> Distal of the Pier Abutment -> Mesial of Pier Abutment (Unseating)   

<u>Using periodontally compromised teeth as abutments</u>

- Studies in Scandinavian countries showed no change in bridge retention after 2-6 years
  - Abutments had >50% bone loss, 2:1 C:R ratio
- *<u>Caveat</u>*: Participants in these small rich countries are well controlled in the research (Come back for checks, and their dental is covered, they don't live very rurally) -> This is harder to monitor in Canada where it's harder to keep track of patients long term to assess the success of the study or for regular cleanings

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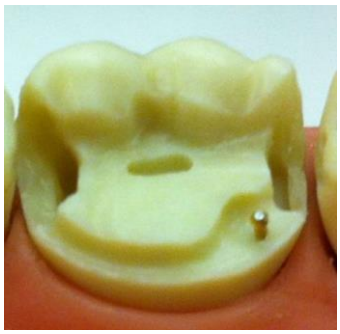
Complex Amalgam's

Amalgam is not the devils material!

- Composite bond to dentin deteriorates over time, but the amalgam seal actually gets better over time!
- Amalgam and Gold are the 2 materials that have the potential to last a lifetime



<u>Retentive Features:</u>

- Pulpal Slot
- Proximal Troughs
- Retentive Groove
- Pin
- Convergent Walls

Don't need ALL of these in one tooth typically

Considerations

Slots and Troughs


Watch out for the pulp

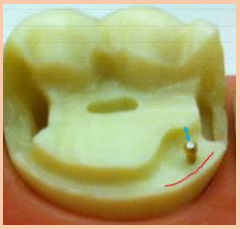
- Usually we are pretty deep by the time we are cutting these in…so tread lightly
- Minimum 1mm depth to gain retention

The longer you make them the ↑ retention we have -> But we are getting closer to the pulp, so balance it out

Walls

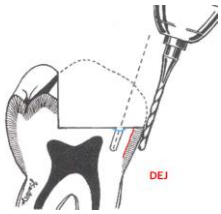
- Convergent or long and parallel
- 1mm Wall height minimum for micromechanical retention -> HOWEVER carving in the inclined planes will ↓ the thickness too much for it to remain strong
- 1.5-2mm is the minimum for mechanical strength (1mm MIGHT work if there are no stresses)

Pins



- Need to be 0.5mm into dentin (axially from the DEJ)
- Create clearance all around the circumference of the pin for the smallest condenser to fit

Align Pin bur in an angulation parallel to the tooth surface to prevent blowing through the pulp or the side of the tooth (Start with a pilot "dimple" to ensure the drill doesn't move)



Pins are usually reserved for older folks with receded pulps. VERY scare putting a pin in a tooth that has higher pulp horns

Name	Colour	Drill diam (in.)	Pin diam (in.)	Depth limit	Material
Regular	gold	.027	.031	2.0 mm	Gold-plated SS
Minim	silver	.021	.024	2.0 mm	Titanium
Minikin	red	.017	.019	1.5 mm	Titanium

0.002in different between Pin and drill diameter -> VERY easy to strip the hole
- If you fuck up, use Minim pin (slightly larger and wider) to re-engage the walls

Carving

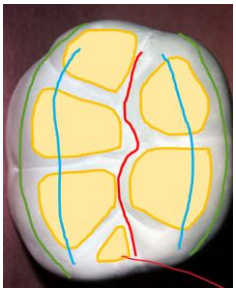
Pro Tip:

- Place toffemire around like usual, but *lay a sectional bean along the buccal margin* to give that rounded contour we love

Overfill a butt tonne so you can carve away the mercury-rich top layer and still have enough for cusps

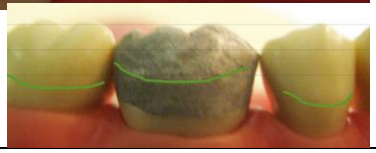
Steps:

1. Establish height of contour
2. Establish the lingual/Buccal cuspal lines
3. Establish the central groove
4. Position the cusps
5. Carve occlusal scheme



(This is a 46)

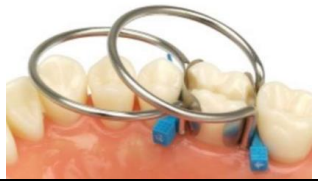
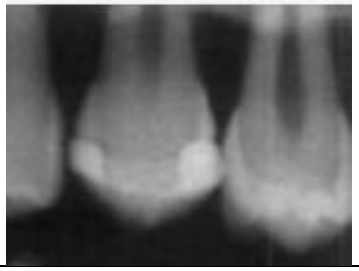
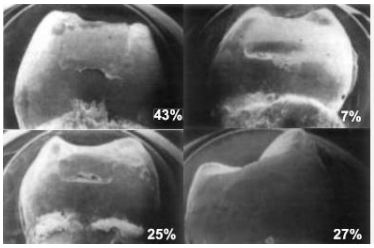




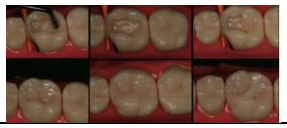
(HOC is too high here)

Large Class II Composites

I mean…kinda like doing a composite normally

Matrix System	*Criteria*: - Perfect gingival seal - Perfect B/L seal - Curved and intact matrix - Proper size and shape of wedge - Stable ring in place  
Wedges	*Function*: - Seal the gingival margin - Shape the gingival embrasure - Provide teeth separation when needed - Slightly retract the papilla when needed  **Want the wedge to be about ½ through**
Sectional Band	*NOTCH IS DOWN* 
Garrison Rings	 This is the new Garrison Composi-tight 3D ring - Apparently they have a few of these at CSD if you give them a wink they will hook you up -> This is likely the bullshit from the 80's that they will give you though ->  *Functions*: - Stabilize the sectional matrix - Slightly separates the teeth to improve proximal contact - Seal the lingual and buccal cavosurface margin - Stabilize the wedge in place
Bonding Procedure	If you are using a self etching primer (Like a Universal Adhesive or a 2 step Self Etch) then you should still selectively etch the enamel with 37% phosphoric acid - This provides a more robust enamel etch that enamel needs, and then the acidic primer will take care of the smear layer on the dentin  **In 33% of composites placed we see a RL along the box of the floor of the proximal box -> 25% of these have been confirmed with SEM as pooling adhesive at the bottom of the box**  

The Restoration

1. Build up Proximal Wall 1st	- Controls C-Factor - Ensures proper seal and margins - Improves curing - Enhances anatomy *Gingival margin is where most composites fail* 
2. Build each cusp one at a time	This helps ensure nice looking anatomy 😊  
3. Finish and Polish	- Use diamond and carbide burs to finish the occlusal anatomy - Soflex discs are great for the embrasure space  

Post and Core for Endo Tx Teeth

First things first…Why are endo treated teeth weaker?

- Missing tooth structure (Caries, Endo, Resto, Trauma)
- ↓ Proprioception causing ↑ loading on tooth
- Previous idea (Debunked): Desiccation after pulp is removed

Prognosis of Endo Tx tooth	*Assess*: - Quality of Endo Tx teeth (apical and coronal seals, microleakage?) - Amount of remaining tooth structure remaining (Radicular dentin, Coronal tooth structure) -> Is there enough ferrule? **1.5-2mm** - Vitality of the tooth ….ummm its RCT'd this tooth is dead - Technical Aspects (Type of post, length of post, core material etc)
When do I need to start thinking of Posts	- To retain a core when there is inadequate tooth structure - Recommended for Anteriors and premolars with significant loss of tooth structure **Posts DON'T strengthen the root -> Infact they ↑ the risk of fracture if over instrumented**

Post and Core Materials

Custom Fabricated	Prefabricated
- Cast alloy -> Post and Core are fabricated as 1 piece - 2 Steps (2 Appointments): Post Pattern + Lab Fabrication	- Stainless steel / Titanium alloy / Fiber Post - Direct Core creation: Amalgam, Comp, GI, RRGI - 1 Step (1 Appointment)

Core Materials Hinted Exam Q		
Material	**Advantages**	**Disadvantages**
Cast Alloy	- **Strongest**	- Most Expensive - **Take 2 appointments**
Amalgam	- Good compressive strength - Simple	- **Weak shear/tension strength** - Poor esthetics for anterior teeth (**Look grey**) - Delay before prep
Composite	- **Most Efficient** - Good initial fracture toughness - Potential adhesion - Potential F^- release	- **Stability over long term is questionable** - Leakage close to crown margin questionable - Weaker than amalgam
Glass Ionomer	- **Adhesion to tooth structure** - **F^- release** - Quick and easy to use	- **WEAK AF** ****DON'T USE IF > 40% OF TOOTH IS MISSING****
Resin Reinforced Glass Ionomer	- **Potential adhesion** - **Potential F^- release** - Efficient and easy - Stronger than GI	- No long term studies - Questionable stability and leakage - **Weaker than composite**

Core restorations replace missing or weak tooth structure -> BUT the strength of everything comes from the remaining tooth

- **Need at least 1-1.5mm of dentin between the prep and the core margin = Ferrule**

Tx Options based on Tooth and Remaining Structure

Tooth	Intact Crown	Most of tooth structure remains	Tooth structure remains but is weak
Molar	Cover the Cusps Onlay/Crown	Amalgam/Composite core retained by intact pulp chamber Onlay/Crown	Amalgam/Composite Core w/ Metal ***prefab. Post*** Crown
Premolar	Cover the cusps Onlay/Crown	Amalgam/Composite core retained by intact pulp chamber Onlay/Crown	Amalgam/Composite Core w/ ***Metal prefab. Post OR Cast Post&Core*** Crown
Canine	Direct Resto of Endo Access	Composite Core with prefab. Post Crown	Cast Post & Core Crown
Incisor	Direct Resto of endo access	Composite Core with prefab. Post Crown	Cast Post & Core Crown

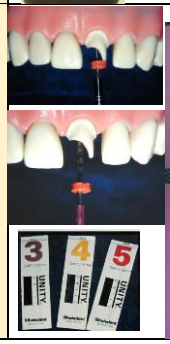
Cast Post & Core

Anterior tooth with a cast post & core -> restore with an MCC:

- Cast core would should through an ACC, so MCC will have better esthetics

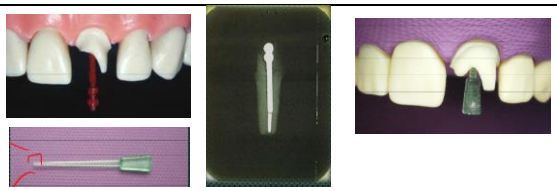
Alternatives:

- Bake opaque mask onto core and then restore with ACC
- Use Opaque Zirconia, cut it back and layer with esthetic ceramic

Procedures	
1. Crown Prep - Remove existing resto's, caries and unsupported tooth structure - Establish the appropriate margin for your crown material (Shoulder vs Chamfer) - Consider Anti-rotational notch in the chamber to prevent rotation of post	 
2. Radiographs - Assess the length and diameter of canal (Post endo-film) - Select the Parapost plastic post accordingly ***A few guidelines for the length of post we want:*** - Crown:Post Length = 1:1 - 2/3 the length of root + 5mm GP - ½ the length of root in bone + 5mm GP	 
3. Remove GP to planned post length - Use a Heated Endo Spreader - Leave 5mm of GP as an apical plug at the end	
4. Refine with Gates Glidden Drill and Prepare with Parapost drill - G.G will remove the bulk of GP - Incrementally work your way up in the G.G **(2-3-4)** and Parapost Drill **(3-4-5)** Should be a minimum thickness of 1.0mm of tooth structure around the post at the midroot and beyond	  Refine with 1.1mm G.G (#4) and finish with 1.25mm Parapost (#5)

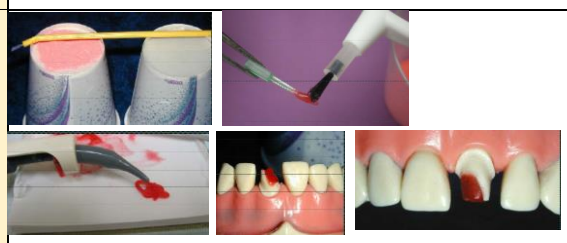
5. **Fit the Plastic Parapost** (and verify length radiographically with metal post)

   - Some modern plastic posts have opacifiers in them to appear RO on a radiograph
   - Can trim the tip of the plastic post off to decrease the risk of breaking
   - Plastic posts are designed to burnout in processing w/o ash when the casting is finished



6. **Add GC Pattern Resin to the burnout post**
   - Can use the resin dot technique where you pick up a ball at a time with the brush. Or can mix a batch and load into a compule to inject into the space all at once
   - Over build the core with resin ensuring there are no voids at the margin and to prevent underpreparing
   - Refine Crown prep with pattern in place

*Very important to lubricate the canal with KY jelly or the post will be stuck in the tooth forever

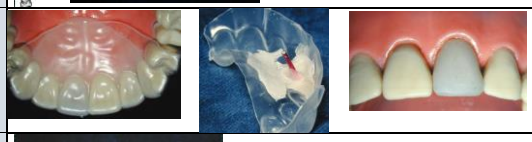


7. **Send Resin pattern to Lab with prescription to cast in metal alloy**

Making a Provisional

1. **Place metal post in canal**
   - Trim the bulb at the top to allow the provisional to have enough thickness

2. **Put Vacuform on and make provisional like usual**
   - Ensure you have enough space through the vacuuform



3. **Cement the Provisional on**
   - Use a non-eugenol based cement. Eugenol interferes with polymerization (would need to clean out the canal thoroughly to remove residue)

4. **Get the Cast Post & Core back**
   - Ensure passive fit
   - Verify radiographically that it extends all the way to the GP plug

Check for bulky spots with GC Fit Checker (Ask dispensary for it)

➔ Coat the entire post with a thin layer and insert. Look for spots that the checker has rubbed off of

5. **Clean the casting, canal and tooth for Cementation**
   - Can sandblast with aluminum oxide, or clean thoroughly with alcohol
   - To clean canal space -> Etch and rinse to remove all temp cement residue & dry with pater points

6. **Cementation of cast post and core**
   - Use Resin Modified Glass Ionomer Cement (RMGIC)
   - Use a paper point or a lentule spiral to coat the canal with cement

Initial bond strength is high, but there is speculation that due to porous dentin that the fluid will hydrolyze the bond…so in the long term, the cement is more like a frictional luting agent

Prefabricated Fiber Post and Composite Core

When do we need a post and core?

- Post is used to retain a core in a tooth with extensive loss of coronal tooth structure

Materials	
Metal - Stainless Steel - NiCr alloy - Ti Alloy	More likely to induce vertical root fracture -> Tooth will break before the post under heavy load
Fibre-reinforced Composite - Carbon Fibre - Glass Fibre	More likely to break before the tooth -> Safer against vertical root fractures 😊 **Pros/Cons** - Weaker compared to metal (This is both good and bad) - Less likely to cause vertical root fracture 😊 - Easier to remove 😊 - Composition generally enables adhesive bonding
All Ceramic Posts - Zirconia	Not a lot of studies yet…but the posts shatter
Shape	
Parallel	This is what we used in Sim - Less conservative and harder to use with curvy canals
Tapered	Use tapered in actual clinic - More conservative and can follow anatomy of root canal easier If there is not an adequate apical stop, tapered can induce vertical root fracture though
Design	
Passive	This is what we want - But not too passive -> If there is a large ovoid canal and the post is loosey goosey, then a cast post would be better
Active	This is not what we want…

Studies have shown…

- Annual failure rate of 4.6% (Pretty high actually)
- Incisors and Canines = 2x ↑ in failure vs premolars and molars
    - This is because incisors and canines are usually loaded obliquely, where posterior teeth are loaded axially
- More loss of cavity walls (not being conservative) = 2x ↑ risk of failure

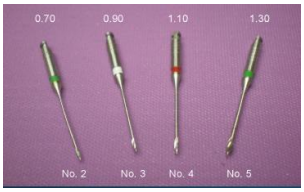
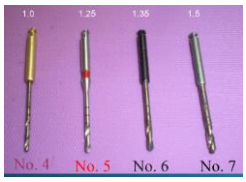
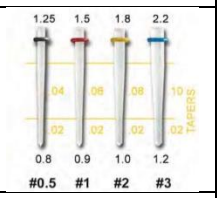
Requirements of a Post

1. 5mm of GP for apical seal
2. Passive Fit
3. Length (2/3 length of the root, OR ½ length of the root in bone)
4. Diameter < 1/3 width of the root
5. Retentive features (if needed)
6. Must be able to retain a core

Ferrule

What is it and why is it important?	= Vertical band of tooth structure at the gingival aspect of a crown prep - Helps to resist spreading forces through a post when it is loaded - Primarily provides resistance form and has some effect on retention
How much is necessary?	**Ideally 2mm** - 1.5 or even 1mm might even work but there is an ↑ risk of failure
What if we don't have adequate ferrule?	- Crown lengthening - Orthodontic extrusion - Extraction +/- Implant, FDP, or PRDP

Technique

1. Remove Gutta percha to planned post length	- Use a heated endo spreader or a Touch and Heat - Leave 5mm GP apically ***Ideally Post length should be:*** - 2/3 total length of the root OR… - ½ the length of root in bone
2. Refine Canal preparations	Refine with Gates Glidden burs and prepare the canal with Parapost drill - Should have minimum of 1mm of tooth structure around the post at midroot and beyond Its important to know the sizes. A #4 GG Does not correspond to a #4 Parapost. - The Parapost drill # is typically 1 higher than the GG  
3. Choose Post	***Dual Taper Light Posts:*** - Coronal taper is wider than the apical in order to fill the coronal flare better.  
4. Rubber Damnnnnnit	20% ↑ in success when you use a rubber dam when cementing in the post…just do it
5. Clean canal for cementation	Thoroughly clean and dry the canal space - If you are confident it is clean, then just rinse with water…but if you are sketchy about it then you can etch (35% phosphoric Acid) as well -> ENSURE all the etch is rinsed out Dry with paper points  **No not use NaOCl or H_2O_2 -> They alter the dentin and ↓ the bonding strength**
6. Apply Cement	Cement we use is **BisCem** - Self etching, Self Adhesive (Dual cure) Apply a little to the post and if you want a little to the canal space -> Spread evenly with microbrush - Insert - Remove excess with microbrush - Light Cure -> This will take care o the coronal 2-3mm, the middle and apical 1/3rd will self cure 

Core Restoration

= Foundation restoration that restores sufficient coronal anatomy of a vital or endodontically treated tooth

Requirements of a Core

1. Must retain a crown
2. Must have Retentive elements as needed (for #1)
3. Proper Taper
4. Proper reduction for esthetics, marginal integrity and structural durability
5. Proper ferrule effect
6. Proper occlusal clearance

Ideal Properties of a Core Material

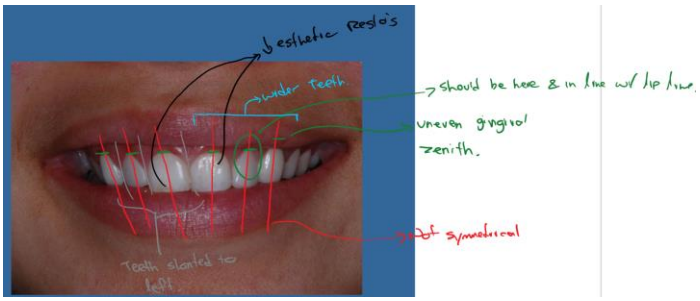
1. Adequate compressive strength
2. Sufficient flexural strength
3. Biocompatible
4. Resistant to leakage of oral fluids
5. Ease of manipulation
6. Ability to bond to remaining tooth structure
7. Thermal CTE and contraction similar to tooth
8. Dimensionally stable
9. Minimal potential for water absorption
10. Resist/inhibit dental caries

Nothing we use is able to check all of these boxes, so we need to pick the best for each case

- Typical Core materials: Cast Metal, Composite Resin, Amalgam
- Composite resin results in more "favorable" failures that cast post and cores -> Meaning the composite breaks and not the tooth/root, which allows for ↑ chance of re-restorability

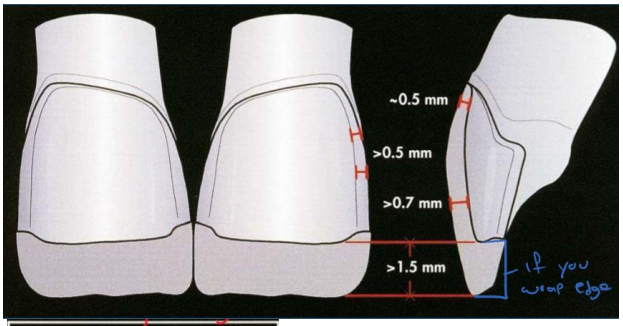
Porcelain Veneers

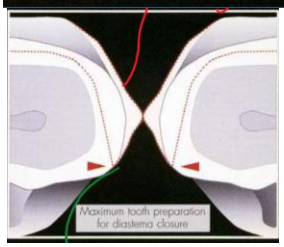
What are they?	Thin bonded ceramic restoration that restores the **facial**, **incisal,** and part of the **proximal surfaces** of teeth needing esthetic rehab
Indications	*Structurally **sound** teeth with:* 1. *Tooth Discoloration resistant to bleach* - Intrinsic Staining - Veneers are pretty thin and translucent…if the staining is heavy (like in tetracycline) if might not work 2. ***Mild** Morphological Variations* - Crown malformation - Gingival spacing - Minor coronal fracture - Minor misalignment of teeth - Diastema - Worn incisal edges - Minor erosive lesions ***Advantages over Crowns:*** - More conservative of tooth structure - ↓ chance of pulpal involvement - Supragingival margins = gingival health - Esthetic (Meh crowns look good too) - Cheaper lab costs usually
Contraindications	1. Lingual Involvement 2. Occlusion - Major bruxism 3. Major morphological defects (Developmental or acquired) - Enamel is what gives us good bonding -> If there is extensive enamel breakdown = poor retention  ***Complications***: - Occurs about 7% over 15 years - Cracks, Chips, Fractures - Marginal Stains (Microleakage) - Parafunction (Clenching and Bruxism)

Diagnostic Workup	Take Diagnostic Photos to assess: - Smile - Gingival esthetics - Interdental Spacing - Diastemas - Color  *Look at all of these things and ask yourself "What do I need to change to improve any of these?"*
Diagnostic Wax-up	Predicting the final outcome - Helps establish and evaluate occlusion - Helps in other planning - Lets us know if veneers are actually good looking - Lets us make vacuform for provisionals (Make a duplicate impression and cast of the waxup) Diagnostic preps - Helps us decide Crowns vs Veneers Communications - Lets us show the lab what we want it to look like - The Pt can see an idea of their new smile
Mock Try-in	Fill the vacuform w/ integrity and place in the mouth - Gives the patient an idea of how if will look

Tooth Preparation

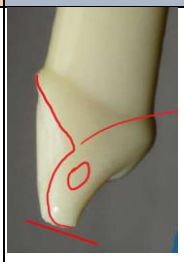
Tooth Requirements	Material Requirements
- Preservation of Tooth Structure - Preservation of Periodontium	- Retention and Resistance - Because ↓ tooth prepping we are relying mostly on bonding…keep as much enamel as possible - Structural Integrity/Durability - Marginal Integrity





Margins	Diamond Chamfer Equigingival
Reduction	0.5mm at margin 0.7mm facially 1.5-2mm incisally (If you are wrapping the incisal edge) If the tooth is tipped lingually, you might not need to reduce at all, but define the margin - Opposite if it is labially tipped. Need to reduce more
Contacts	If there is a sound interproximal resto we can leave it in Can close diastema's if Pt wants *If closing the diastema make sure you reduce enough *
Finishing	No sharp angles No undercuts Softflex disk to smooth the facial completely (NO evidence of depth cuts at all, even the slightest groove will show up)

When do we reduce the Incisal edge?

No Incisal Reduction	Yes Incisal Reduction
 **Indications**: Intact tooth No incisal wear Crown length is ok Mostly just not stoked with esthetics of the tooth	 Tuck the interproximal reduction under the contact so they cant see it from the side (do this w/ or w/o incisal reduction actually) **Indications**: - Wear Issues - Length Issues ➔ Create a Butt Margin (not a chamfer) *Find out where the contact is in ICP. Keep Butt Margin 1mm away from contact in either direction -> If you MUST you can make the contact completely in ceramic, but keep it light*

Shade Selection

Need to determine:

- ***Stump shade***
  - VERY important because veneers are so thin, the lab needs to know what they need to mask. Send a photo with the stump shade aligned with the long axis of the tooth if you can
- ***Translucency + Opacity***
  - Amorphous structure of porcelain makes it very hard to match the optical properties of crystalline enamel. Visible light and UV rays will be reflected and absorbed differently
- ***Other color characterizations***

Material Selection

MUST be bondable, whichever you chose

Layered Feldspathic Porcelain - **Glassy Ceramic**	Feldspathic is usually always layered - Different layers of porcelain are painted on and then baked in the oven Formed from potassium feldspar - Heating it creates a glassy matrix containing crystalline leucite phase (up to 45% by volume) Sintered fabrication 
Pressed Ceramic (eMax) - **Lithium Disilicate**	1. Lab scans digitally 2. Lab designs digitally 3. Mills all the different layers and heat presses them together Glassy ceramic matrix with lithium disilicate crystals - Crystals are highly interlocking - 60-70% lithium disilicate by volume - More opaque than feldspathic and leucite reinforced 
Leucite Reinforced Ceramic - **Empress**	Also usually milled these days, or heat pressed Leucite prefabricated and is incorporated into a glassy matrix - Contains 35-55% leucite by volume - Acts as a strengthener -> Promotes crack deflection and ↑ mechanical properties
Zirconia reinforced	We are unsure about this so far - Not sure how well zirconia bonds for the long term - MDP containing cements create the most durable bond at this point

PVS Impression

Criteria

1. Completeness: Entire prep should be visible
2. Margins: No bubbles on margins, and margins should be visible and obvious
3. No Tray show through on prep
4. No separation or tearing of the PVS

Veneer Lab Prescription

Please Fabricate *feldspathic porcelain* veneers for tooth *#11 & 21*

1. Double pour casts; first cast with individual dies duplicated as needed
2. Mount in intercuspal position using enclosed mandibular cast
3. Porcelain *Wrapping/Not Wrapping* the incisal & etch with hydrofluoric acid
4. Maintain contours & length to match maxillary cast (enclosed)
5. Stump *Vita B2* (no discoloration); Final shade *Vita A3*

Return glazed and etched for bonding *Monday March 16, 2020 at 3:30pm*

Thanks,

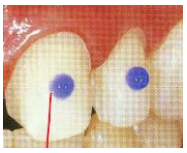
Signature

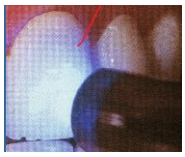
Provisionalization

- If the prep is super duper conservative and no incisal reduction is done you might not even really need a provisional. Enamel is intact and w/o sensitivity from dentin exposure its just esthetics we are really worried about

Steps:

1. Make a Vacuform Integrity provisional like a normal crown -> Be gentle, this is one thin boi
2. Spot etch just a dot on the facial
3. Apply bond only (**No primer**!)
4. Place provisional on and cure the resin through the Integrity

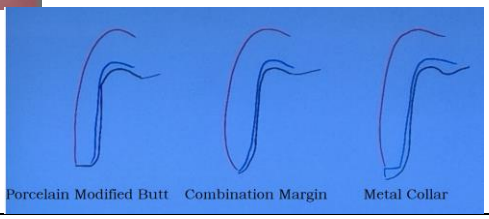


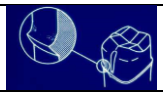
Anterior MCC

Advantages of MCC:

- Good esthetics (Providing you leave enough room for adequately layered porcelain)
- Good strength with the metal support

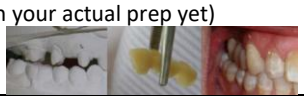
Reductions	

Facial	- 2 plane reduction
	- 1.25mm – 1.5 depth (1.5mm is ideal)
	  - 0.5mm for metal
	  - 0.3mm for Opaque layer
	  - 0.7mm for esthetic porcelain
	 
	Margins:
	- Metal collar
	- Porcelain Butt
	- NEVER do porcelain over metal (Combination) margin.
	 
	*Modified shoulder shape**

Lingual	0.5mm depth for metal only - Chamfer shape  

Provisional Materials

Methyl Methacrylate - Jet Acrylic **Ethyl Methacrylate** - Trim	- ↑ durability - Generates heat when it polymerizes though = Possible damage to pulp
Composite Resin - Integrity	- ↑ Handling - ↓ Durability vs the methacrylates - No Heat generation on polymerization = better for pulp

Direct Provisionalisation (The UBC way)	Uses: - Templates (Vacuform) - Pre-Crown Prep impressions (Putty Impression) - Prefabricated shells (Aluminum, or Polycarbonate) 
Indirect Provisionalization (For larger cases)	1. Take an impression of the prepared cast 2. Fabricate provisional directly on the cast (Extra-orally) 3. Refine intraorally if needed 
Combination (Large cases as well)	Do a diagnostic preparation on the cast Fabricate the outer shell extra orally (The inside will not match your actual prep yet) Do an intraoral reline of the intaglio surface of the shell 

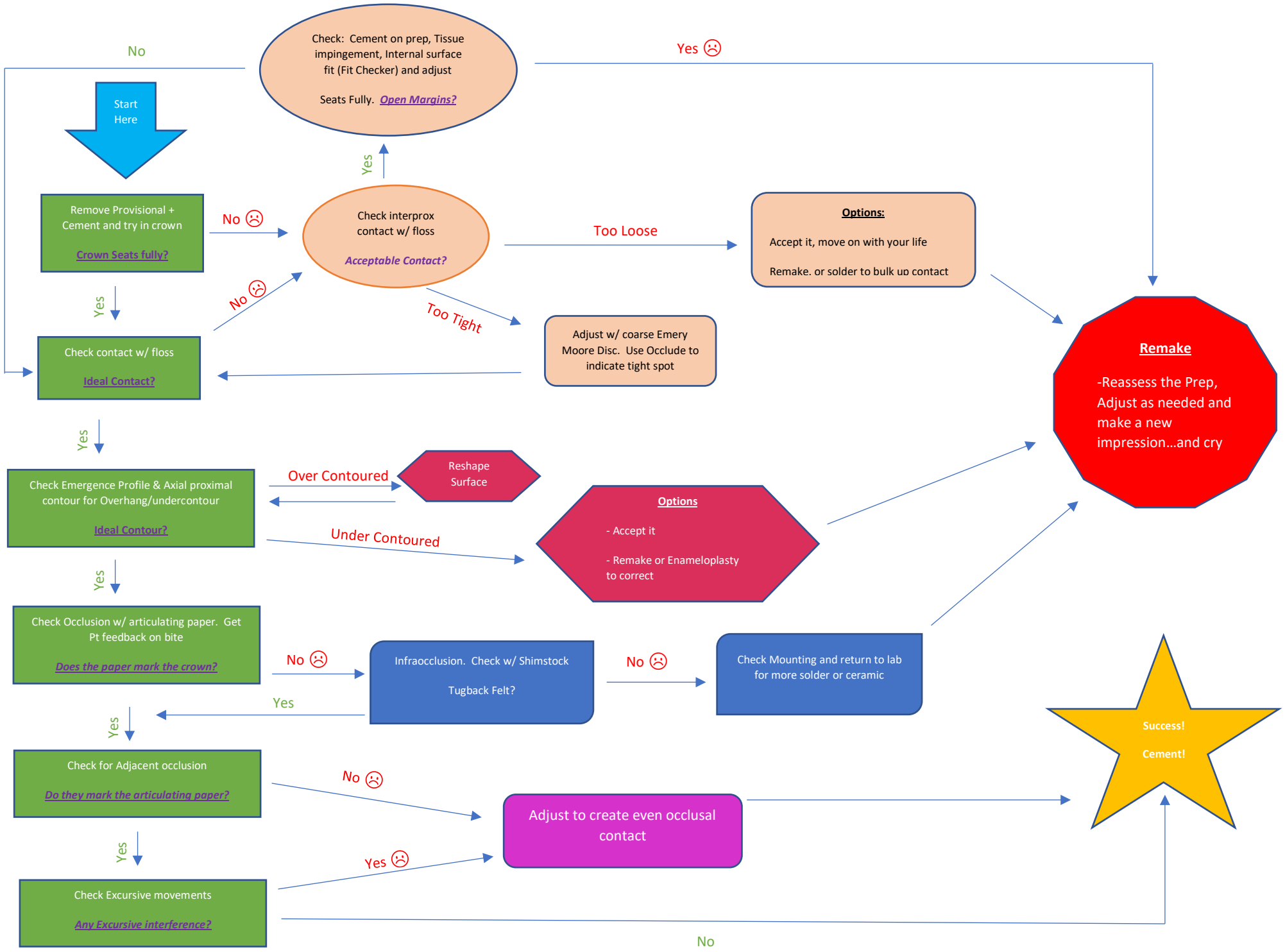
Cements and Cementation

Cements Available in CSD for Fixed Prosthodontics

Restoration Type	Bonded Material	Cement Type	Brand at UBC
Full Metal (Inlay, Onlay, Crown, MCC)	Metal Alloy w/ or w/o ceramic veneer	RMGIC	**RelyX Luting** [3M Espe]
All Ceramic -> Zirconia Coping	Zirconia	RMGIC	**RelyX Luting** [3M Espe]
All Ceramic -> Monolithiccccc (Inlay, Onlay, e.Max Crown)	Lithium Disilicate (e.max)	Dual-cured Composite Resin Cement	-**Biscem** [Bisco] -**Variolink Esthetic DC** [Ivoclar] -**Duo Link** [Bisco] -> Fibre post bonding kit
Porcelain/Ceramic Laminate Veneers	-Feldspathic ceramic -Leucite reinforced Ceramic (Empress) -Lithium Disilicate (e.max)	Light-cured Composite Resin Cement	**Choice 2** [Bisco]
Resin-bonded FDP (Maryland Bridge)	Base metal alloy	Dual Cure Composite Resin Cement	**Panavia** [Kuaray]
Luted Implant Crown	Metal alloy w/ or w/o ceramic	Temporary Cement	**Temp-Bond** [Kerr]

Crown Cementation Flowchart:

1. Check Case ID -> Make sure it's the right Pt
2. Check Crown on cast
3. Check Shade
4. Give LA if needed and begin the below flow


Start Here
Remove Provisional + Cement and try in crown
Crown Seats fully?
No
Yes
Check: Cement on prep, Tissue impingement, Internal surface fit (Fit Checker) and adjust
Seats Fully. Open Margins?
Yes
Check interprox contact w/ floss
Acceptable Contact?
No
Too Loose
Too Tight
Options:
Accept it, move on with your life
Remake. or solder to bulk up contact
Adjust w/ coarse Emery Moore Disc. Use Occlude to indicate tight spot
Check contact w/ floss
Ideal Contact?
Remake
-Reassess the Prep, Adjust as needed and make a new impression…and cry
Check Emergence Profile & Axial proximal contour for Overhang/undercontour
Ideal Contour?
Over Contoured
Reshape Surface
Under Contoured
Options
- Accept it
- Remake or Enameloplasty to correct
Check Occlusion w/ articulating paper. Get Pt feedback on bite
Does the paper mark the crown?
Infraocclusion. Check w/ Shimstock
Tugback Felt?
Check Mounting and return to lab for more solder or ceramic
Success!
Cement!
Check for Adjacent occlusion
Do they mark the articulating paper?
Adjust to create even occlusal contact
Check Excursive movements
Any Excursive interference?

Digital Dentistry

Introduction Indications and Principles of Preparation

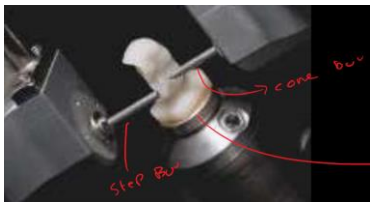
CAD/CAM = Computer Aided Design/Computer Aided Manufacture

CEREC	
Chairside	- No lab involvement - One single appointment from prep to bonding the final impression - No contamination of dentin w/ provisional cement = optimal bonding
Economical	- Unit cost of material is 1/6th -1/8th of an MCC made in the lab - No PVS impression or provisional crown expense - Minimal chair time cost for impression re-takes *Expensive to get into though* - ~$170,000 for the system - More ideal for small group practices vs a single operator
Restorations	*Primarily*: - Full Crowns - Partial veneer crowns/Onlays - Inlays *Other Uses*: - Anterior Crowns - Veneers - Long Term provisional FPD - Implant Crowns
Esthetic	Tooth colored materials available now (VITA shades) - Can stain ceramics and glaze for optimal esthetics Multishade blocks available
Ceramics	*In Office*: - Feldspathic Ceramic (Vita Mark II [Vita]) - Leucite Reinforced Glass Ceramic (Empress CAD [Ivoclar]) - Lithium Disilicate Glass Ceramic (E.max [Ivoclar]) - Zirconia Lithium Silicate (Celtra Duo [Kuraray Noritake]) -> Basically glassy ceramic with some added zirconia - Zirconia (Vita) - Composite Resin (Lava ultimate [3M], Cerasmart [GC], Tetric CAD [Ivoclar] -> For Long Term Provisionals In Lab: - All of the above + Alumina and Zirconia based ceramics

Indications	Esthetic Demands Biomimetics Posterior Teeth (Can do anteriors in some cases) Single units (Inlay, Onlay, Partial or full coverage, Implants) Time
Contraindications	Sensitivity to materials - Ceramic -> Sensitivity is rare - Composite -> Sensitivity is more common Bruxism RPD Abutments FPD Poor access

Milling Chamber

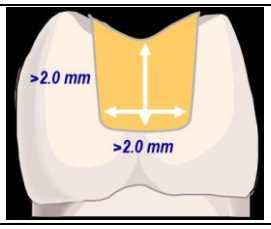
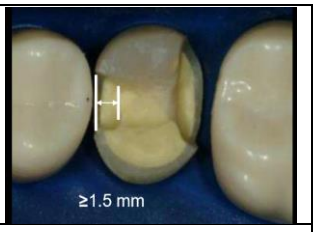
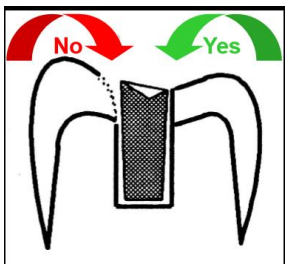
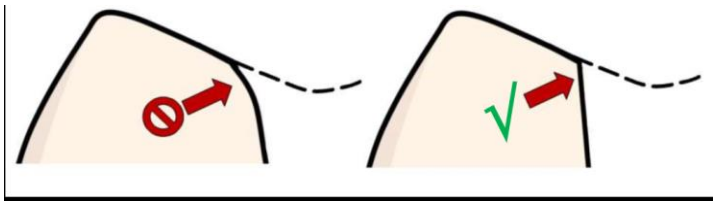
- 2 Burs: -> Dimensions and shapes are important!
  - ***1.2mm-1.6mm Step Diamond Bur*** -> Mills the inside (intaglio) surface of the crown
  - ***1.6mm cone-shaped diamond bur*** -> Mills the outside of the crown

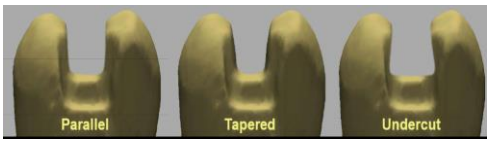
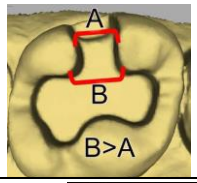
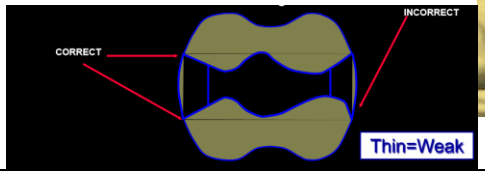
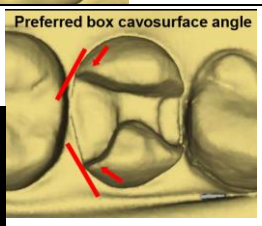


Inlays and Onlays

Whats the Difference?	
Preparation Design	The foundation is similar to analog - Uniform reduction - Smooth surfaces, line angles and transitions *Bonding influences design* - ↓ reliance on traditional retentive and resistance form. Retention from friction is less important than bonded retention - Micro Retention >> Macro Retention for bonded ceramics - Looking for passive fit *Less Fine anatomic form and flatter occlusal tables for prep* - Still want cusp tips, but really round them down - The stepped bur cannot do anatomy smaller that 1.2mm *Maintain certain anatomy* - Cusp tips - Marginal ridges - Oblique ridges
Creating Draw	*Conservative approaches using blockout step by step:* 1. Initial removal of caries and previous restos 2. Immediate dentin sealing/bonding 3. Blockout with resin composite -> THEN complete the outline form prep on the enamel 4. Avoid excessive tooth removal to establish draw
Box Form	90^0 cavosurface angles -> Butt margins No bevels Rounded internal line angles
Cusp Capping Guidelines	1. When <2mm of tooth support at the base = Cap/ Shoe the cusp 2. When Cavosurface/External margin/Joint terminates on the cusp tip = Cap it…the margin is the weakest point and would be under constant chewing force 3. For Endo treated teeth we can full coverage

The Prep

Tooth Reduction	Dimensions: - Pulpal Depth: Minimum 2mm in central groove - Occlusal width: Minimum 2mm in B-L dimension - Box Depth: Minimum 1.5mm Axially (M-D or B-L) **Based on Ceramic strength, not software design**  
Cavosurface margin	Occlusal Cavo: CRISPY w/o Bevel -> Never round or bevel - Non-crispy margins can't be read by the software and will have a margin discrepancy  

Walls	*Occlusal Wall*: - 6-8^0 taper is optimum for internal adaptation and margin fit - Over-tapering = thinner occlusal margins and ↑ margin stress as the margin approaches the cusp Avoid steps in the wall -> Keep it smooth from floor to margin Avoid Bevels  Undercuts on internal walls are acceptable based on clinical judgment of adequate cuspal support
Internal line angles	DON'T leave sharp angles within the prep - These propagate internal stress fractures in the tooth during try-in or after bonding is complete
Proximal Margin	Minimal separation from adjacent teeth - Need just 0.5mm of separation (explorer) to avoid connecting the surfaces in the program - No closed contacts though! 
Cavity extensions	Usually in developmental grooves - Greatest width of the extension should be at the occlusal connection 
Cavosurface Angles	Thin ceramic margins = fracture - Hard to record the margin accurately - Can cause the restoration to bind and not seat completely during try-in 90^0 to a tangent of the cavosurface  

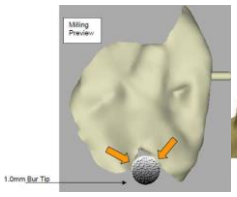
Crowns:

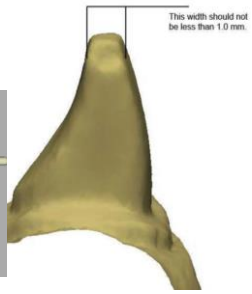
Remember the dimensions of the missing burs:

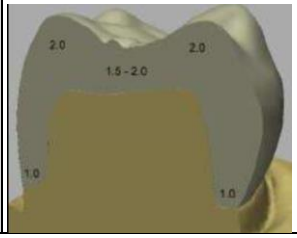
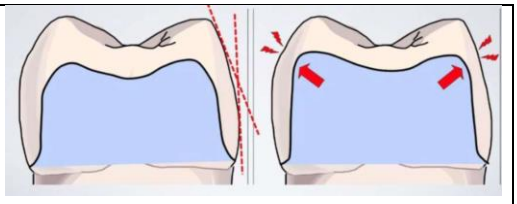
- 1.2mm step bur for the inside of the crown
- 1.6mm cone-shaped diamond bur for the outside

*Nothing should be less than 1mm on the inside of the crown, because the 1.2mm bur cannot cut that small!**

- If you do have details <1mm then the machine will over mill = thin ceramic = weak ceramic = sad you





Reductions	 Axial Reduction: 1mm Central Groove: 1.5mm Supporting cusps: 2mm Non-supporting cusps: 1.5mm  2 Plane Reduction Bruh

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Intraoral Scanning and Imaging

Omnicams are expensive…don't drop

- Always start on the occlusal! Gives the system a good reference point

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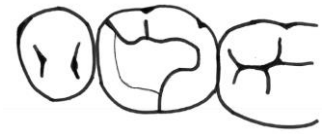
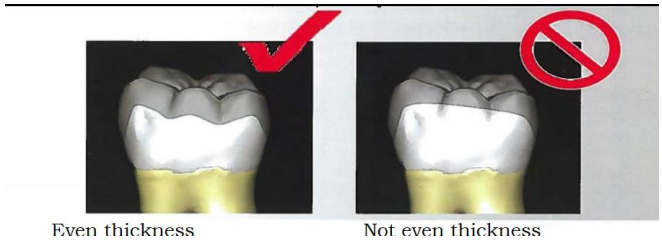
Partial Coverage Restoration



Reductions	Proximal Box Axial Depth: **1.5mm** Proximal Box Depth: **Till Gingival contact is open** Lingual Axial Depth: **1mm** Occlusal Depth: **2mm** *Overall rounded form with no bevels*
Margin	Butt margin: Cavosurface 90º Occlusal Divergence with smooth transition from wall to floor

Undercut…how do we manage?

Not conservative!

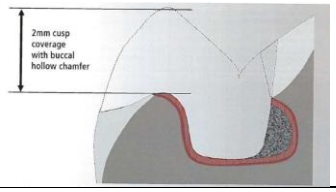
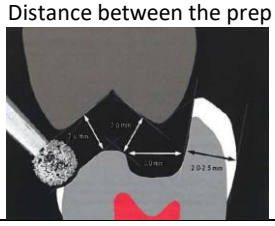


Even thickness

Not even thickness

Conservative approaches using blockout step by step:

1. Initial removal of caries and previous restos
2. Immediate dentin sealing/bonding
3. Blockout with resin composite -> THEN complete the outline form prep on the enamel

Reduction Vs Clearance	
Reduction	The amount of tooth removed, NOT taking into account the occlusion 
Clearance	Distance between the prep and the opposing tooth while in occlusion 

Adhesive Cementation

Micro-mechanical retention (Vs. Macro mechanical) allows for the conservation of tooth structure -> Providing adequate adhesion procedures are used

- Success depends on the luting agent -> Must ensure an effective, durable bond btwn restoration and tooth structure, AND is responsible for marginal integrity

Requirements of Luting Agents:

1. Low Solubility
2. High radiopacity
3. Good esthetics
4. Biocompatible
5. Adequate working time

Luting Cements based on Polymerization	
Chemical Cured	*Advantages:* - Can be used in areas without access to light *Polymerization Component:* - Peroxide-amine *Procedure*: - Maryland FPD - MCC Crowns - Posts
Light Cured	*Advantages*: - Longer Working Time - Better color stability *Polymerization components*: - Camphorquinone for light activation *Procedure*: - Ceramic Veneers *Examples*: - Choice 2 [Bisco]
Dual Cured	*Advantages*: - Controlled working time - Adequate polymerization in areas w/o sufficient light *Polymerization components*: - Peroxide-amine for chemical poly - Camphorquinone for light activation *Procedure*: - Inlay - Onlay - Crown *Examples*: - Duo-link [Bisco] - RelyX Ultimate [3M] - Variolink Esthetic [Invoclar]
Resin Cements	
Components	*Matrix*: - BIS-GMA - UDMA - TEGMA *Filler:* - Inorganic particles: Quartz, Glass - Radiopaque components - Pigment **Higher filler volume ↓ polymerization shrinkage, thermal expansion and wear, and ↑ Modulus of elasticity**
Facts	Traditionally these were recommended for All-Ceramic resto's b/c: ↓ solubility, ↑ esthetics and ↑ bond strength - HOWEVER, it is shown that there is ↑ marginal degredation over time w/ wear of the cement …↑ filler has less wear, so consider this if you opt for a resin luting cement

Ceramic Surface Treatment:

- Conventional ceramics w/ Silica, Potash Feldspar, or Soda Feldspar = *Rich in glassy phase = high bond strength to Resin cements*

Goals:	↑ Surface Area Clean internal surface ↑ Surface energy
Acid Etching	*Sensitive*: - Feldspathic Ceramic - Feldspathic Ceramic reinforced w/ leucite - Feldspathic ceramic reinforced w/ lithium disilicate **Vitablocks, IPS Empress, IPS e.max** HF Acid dissolves the glass matrix -> Leaves rough filler w/ micro-retentions -> Pores 0.5-12um deep - Vita or Ivoclar etch = 4.9% HF Acid *Resistant*: - Aluminum Oxide ceramics - Aluminum oxide ceramics reinforced w/ circonium oxide - Zirconium oxide ceramics **Procera, In-Ceram**
Silanization	Silane promotes additional chemical bonding - Bifunctional molecule = reacts w/ inorganic particles of ceramics via -OH inorganic radical + Copolymerizes w/ resin cement via organo-functional radical - Methacrylate

Now there is Monobond Etch & Prime:

- Self-etching glass ceramic primer! -> Etch and silane in 1 step
- Safer to use than HF acid

Restoration Design

F – Fissure Height

O – Occlusion

C- Contours

C- Contacts

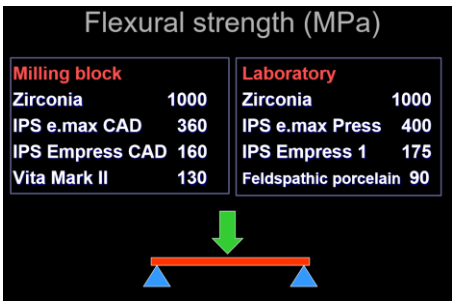
Strength of Materials

Most common failure of MCC's = fracture of ceramic away from metal

- Metal coping stays intact…so the ceramic veneer determines the overall strength (the weakest link)

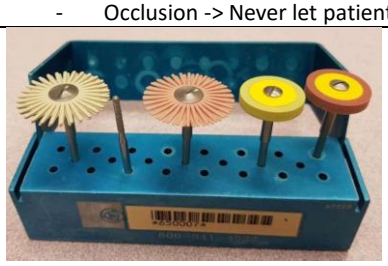
Ceramic Milling Pros:

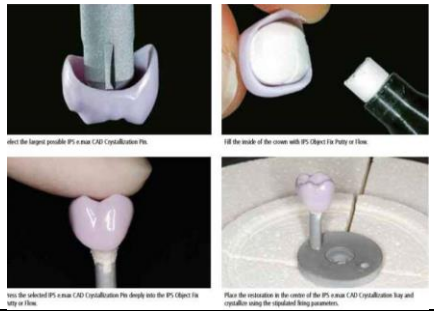
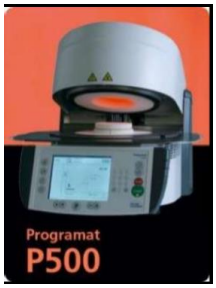
- Manufacturer controls the entire process = improved temperature control for firing, powder particle size and heat treatment times
  - Results in higher quality ceramic vs a lab processed ceramic



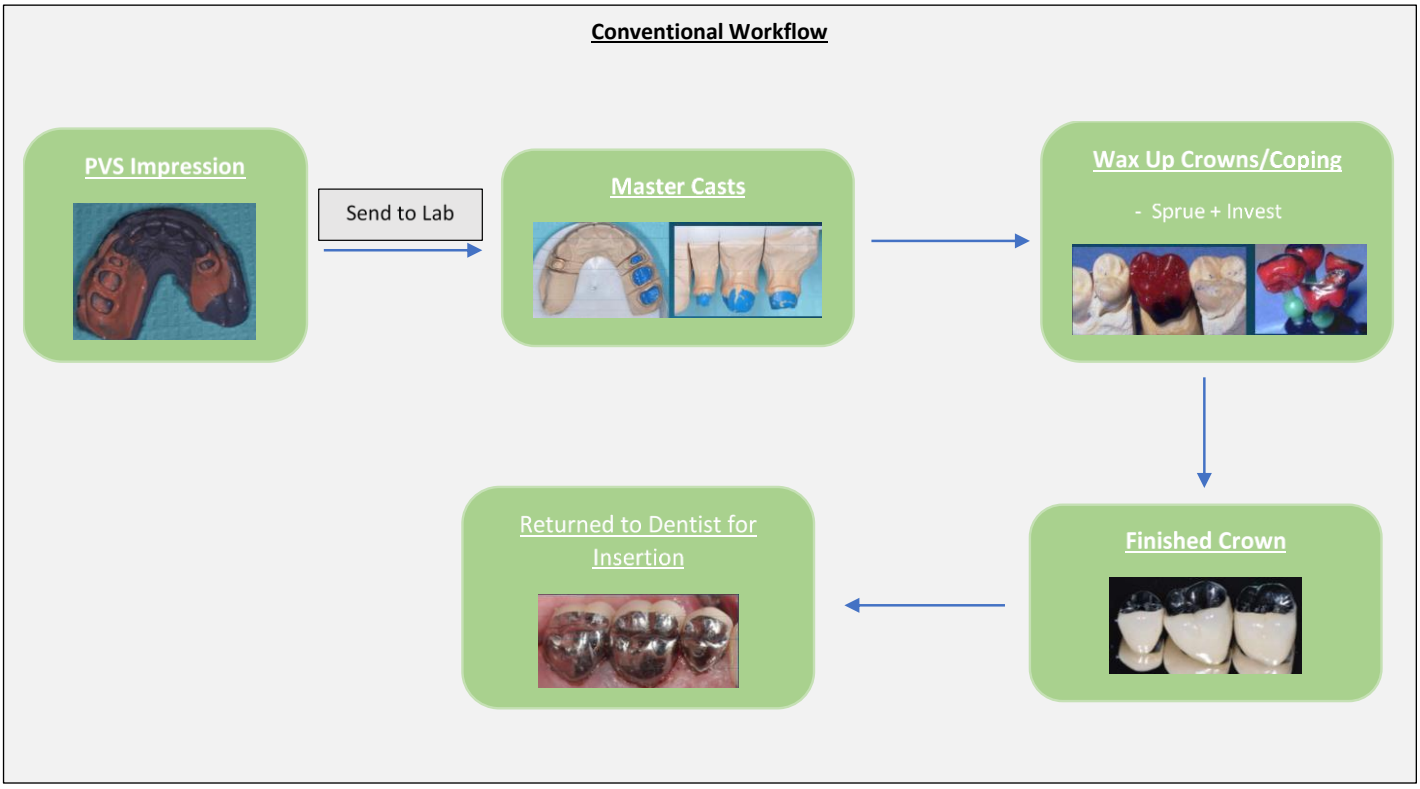
This is a chart we were given with the above information…however it shows that the only thing better than lab processed materials is the Vita Mark II Feldspathic porcelain

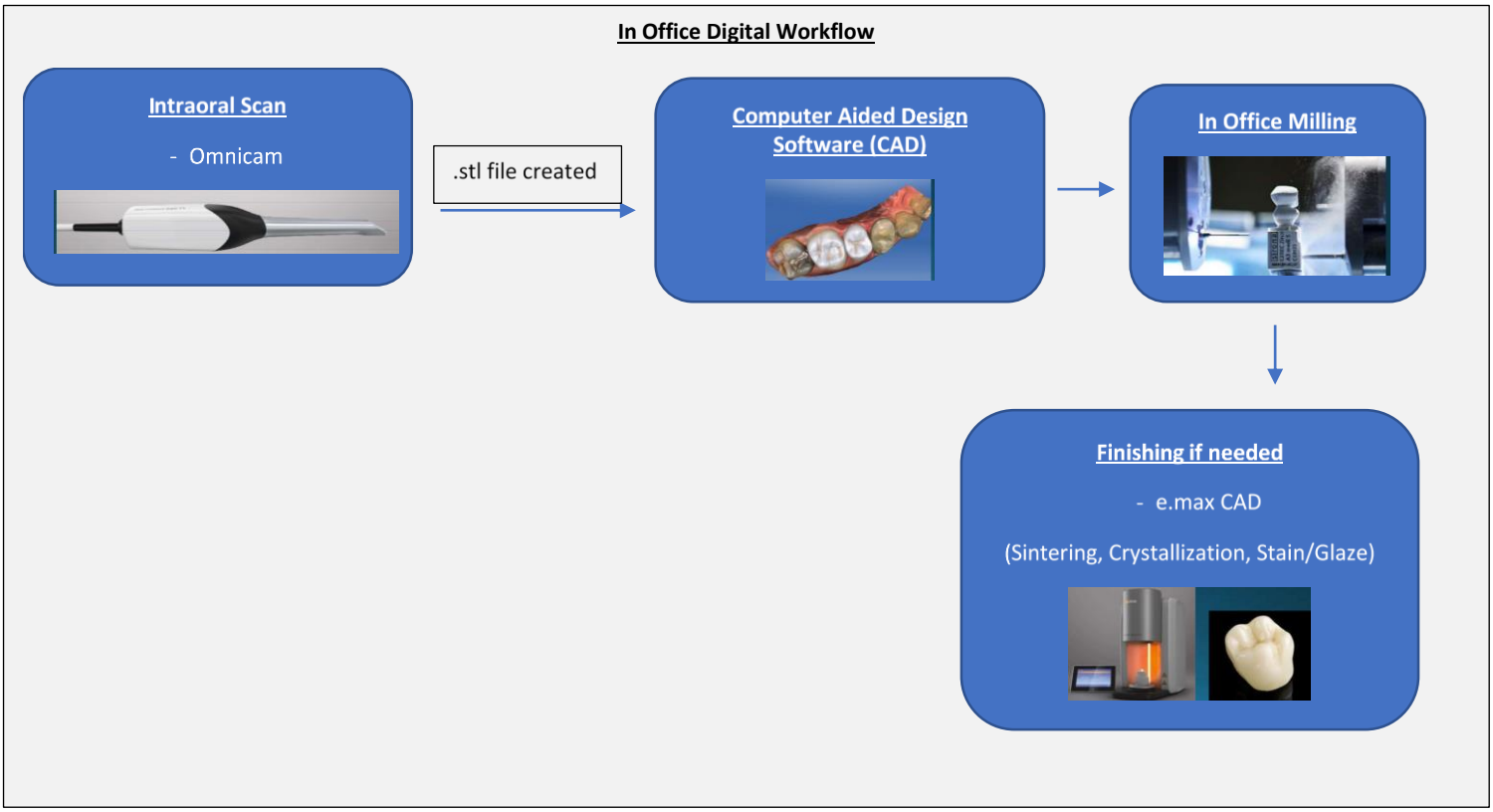
Try-Ins

Things to check	Same as with any ACC restoration: - Remove and polish the sprue carefully - Ensure adequate proximal contacts - If they are too tight, we can remove some…but if it is open we need to re-mill - Margins - Contours - Shade and shape - Occlusion -> Never let patient fully clamp down until it is bonded
Polishing	 Requires progressively ↓ abrasiveness  *No Stripe* = Course *Yellow Stripe* = Fine *White Stripe* = XFine The abrasiveness of ceramics is mostly due to the surface texture -> Make sure it is polished VERY well so it doesn't wear down the opposing dentition Polishing also never comes off, so it is better than glazing
Stain and Glaze	Glaze peels off w/ occlusion and will be gone in a few years - Stain and glaze can create optical illusions and can make a monochromatic block appear polychromatic ***Glaze***: - Low Fusing temps, so the ceramic doesn't melt - Colourless and highly fluid at high temps -> Fills small surface porosities and irregularities - Recreates the glossy appearance of teeth ***Stain***: - Used to develop specific optical surface characteristics/colouring - Translucency, hypocalcification, occlusal staining

e.Max CAD	Milled before crystallization -> Appears blue/purple - Strength: ~130mPA After you mill it = firing to crystallize -> Color changes to the Vita shade - Strength: ~360-500mPa, v. strong - Use e.max specific silicone nitrite firing tray and pins + support the crown on a pin using firing paste - Firing is pre-programmed in the Programat Furnace  

Digital Dentistry Workflows





Digital Lab Techniques

Subtractive Manufacturing
- **Milling Units**

These can be in-office or lab oriented
- Lots of wasted material as you cut it out of a larger block

Different machines have different #'s of movement Axes
- ***4 Axes***
  - Adequate for most simple restorations -> This is our CEREC at UBC
- ***5 Axes***
  - Can manufacture larger prostheses w/ more intricate pieces -> Bridges, Dentures etc

Materials:

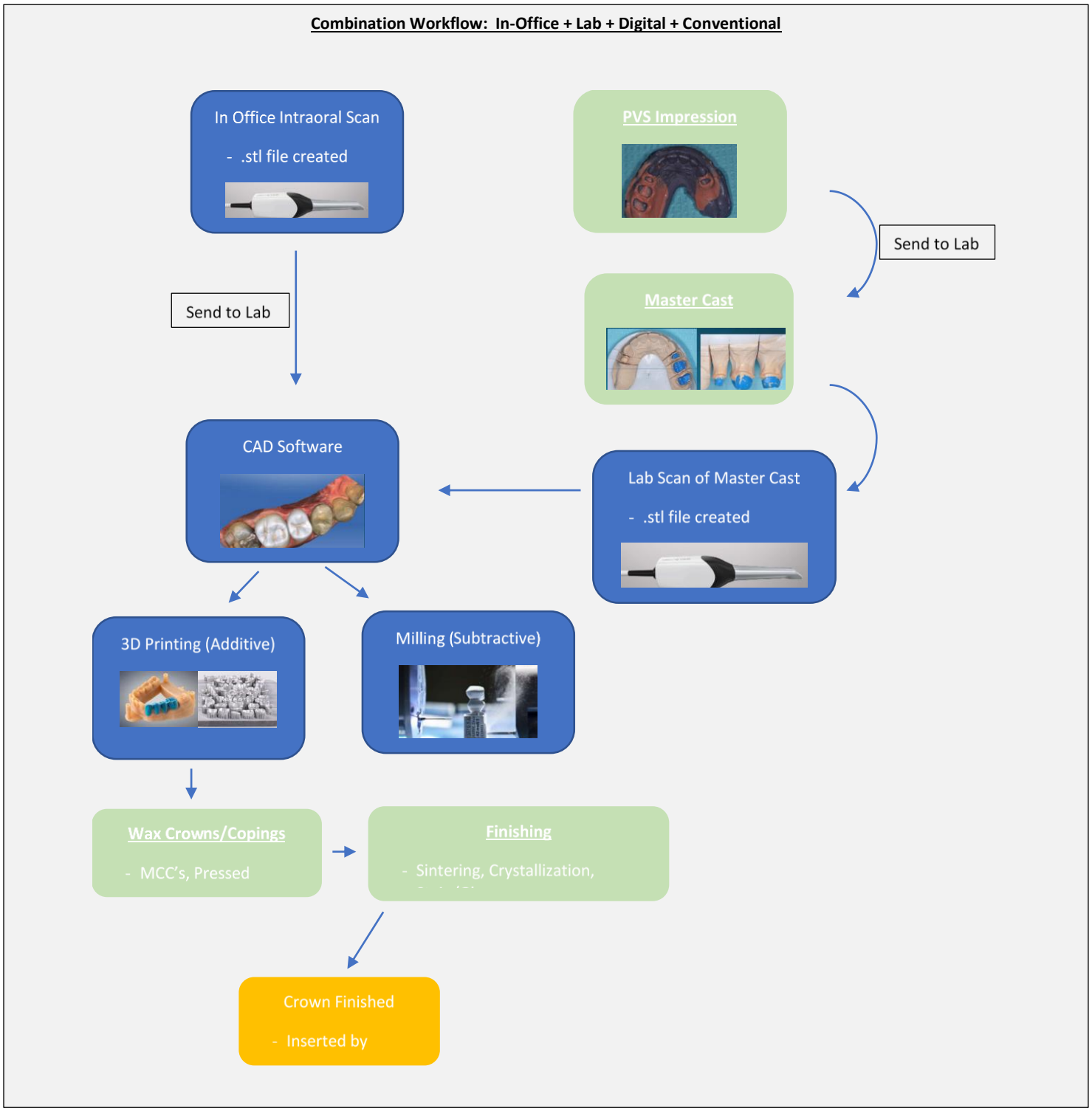
Composite Resin	Like the direct resto material, but its process into a block - Pre-manufactured = ↓ porosities and ↑ strength vs the in office layering technique we usually use
Polymethyl Methacrylate	
Ceramic	- Lithium disilicate -> e.amx [Ivoclar] - Lithium Silicate -> Celtra Duo [Dentsply] - Titanium reinforced Lithium Silicates
Ceramic-Resin Hybrid	These are used mostly for long term provisionals, or inlays/Onlays where you can control the stress on the restoration - Not as strong as regular Ceramics, but stronger than Composite Resin blocks -> Enamic [Vita]
Polycrystalline Materials	Come as a block in a softened state so you can mill it. After words you fire It to harden it to max zirconia hardness -> Stabilized Zirconia
Metals	- Titanium/ Titanium Alloys - Cobalt-chromium alloys

Additive Manufacturing

3D Printing
- *Materials*: Composite resins, Acrylics, Waxes, Bone Grafting scaffolds
- *Uses*: Provisional restorations, Dental models, Occlusal splints
- *Future*: Silicones, Cells/tissues, ceramics

Selective Laser Sintering/Melting
- Materials: Metals, Alloys, Plastics
- Uses: Implant or Partial denture Frameworks, Metal Copings

Combination Workflow: In-Office + Lab + Digital + Conventional



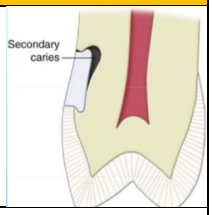
Cariology

Recurrent/Secondary Caries

A reminder, to Dx Caries you need 3 things:

1. Caries Risk Assessment
2. Caries Lesion Detection
3. Caries Lesion Activity Assessment

Some Definitions	
Primary Caries	= Lesion on natural, Intact tooth surface
Recurrent/Secondary Caries	= Lesion developing @ tooth surface adjacent to an existing lesion - A **NEW** primary lesion at the margin of a resto
Residual Caries	= Demineralized tissue left behind before restoration placement w/ a poor seal - If you leave affected dentin behind but have a good seal, the bacteria will starve out and be fine

Recurrent Caries		
Pathogenesis	Etiology is the same as primary caries - Used to think that it was caused by the incomplete removal of the original caries -> This is now Residual Caries	
Defective Restorations	**Marginal Overhangs** - Doesn't necessarily lead to recurrent caries - Can if Pt is high risk, can't clean the area, or isn't aware that they need to spend extra attention there  **Open Contact** - Leads to food trapping and impaction. If Pt's oral hygiene is poor = caries	**Open Margins** - ↑ risk to caries, doesn't necessarily need to be redone though - There needs to be an active problem w/ existing resto to justify redoing it 

Caries-Associated w/ Restorations & Sealants (CARS) Detection Criteria

Code	Summary	Description	Image
Code O	Sound tooth surface w/ Restoration or sealant	- Sound tooth surface adjacent to restoration/sealant margin - No evidence of caries or demineralization after 5 sec air dry - Surfaces w/ marginal defect <0.5mm wide (ball end probe cannot enter defect) - Developmental Defects (Enamel hypoplasia, Fluorosis) - Tooth Wear (Attrition, Abrasion, Erosion) - Extrinsic/Intrinsic Stains = Sound tooth structure - Stained margins w/ no caries and no demineralization (Coffee stain)	
Code 1	1st Visual Change in Enamel	- No evidence of change in color or caries when WET - 5 sec DRY = opacity/discoloration showing demineralization	
Code 2	Distinct visual change adjacent to Restoration	- Demineralization opacity when WET not consistent w/ sound enamel or dentin	
Code 3	Carious Defects < 0.5mm w/ signs of Code 2	- Cavitation at margins <0.5mm AND - Demineralization opacity when WET - or shadow of discolored dentin Tx: - If there is no dentin involved then place fissure sealant over marginal defect	

Code 4	Marginal caries adjacent to restoration w/ underlying Dentin Shadowing	- Characteristics of Code 2 AND - Shadow of discolored dentin visible through "apparently" intact enamel OR - Localized breakdown in enamel but no visible dentin (easier to see when tooth is wet and looks darkened with grey, orange, or brown intrinsic shadow) **Must be distinguished from normal amalgam shadow**	
Code 5	Distinct cavity adjacent to restoration	- Distinct cavitation w/ visible dentin at interfacial space w/ signs of caries described in Code 4 AND - Gap > 0.5mm in width **When margins are not visible:** - Evidence of discontinuity at margin of resto and dentin is detected by 0.5mm ball probe along the margin of resto	
Code 6	Extensive Distinct cavity w/ visible dentin	- Obvious loss of tooth structure - Cavity may be deep or wide with clearly visible dentin on both the walls and base	

Caries Control and Restorative Care

ICCMS differentiates between 2 recall decisions:

1. ***Monitor the lesion and check progression*** (Timeline depends on age + risk)
   - q3months for Children < 18 yrs old w/ high caries risk
   - q2years for adults w/ low caries risk
2. ***Provide preventative intervention, review behavioral + OH change plans***

Prevention is ongoing and dynamic -> Must engage patients in reviewing dietary and OHE

Likelihood of new lesions

- Factors in the Caries Risk Status + Current Caries Activity Status

Caries Risk Status	Current Caries Activity		
	Inactive Lesion	Initial stage active lesion	Moderate/Extensive Active
Low Risk	Low Likelihood	Moderate Likelihood	Moderate Likelihood
High Risk	Moderate Likelihood	High Likelihood	High Likelihood

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Acute/Rampant Caries

Definition	= Multiple *active* carious lesions occurring in the same patient - Rapidly progressing results in early pulpal involvement and affects surfaces not usually affected by caries

Classifications	*Classifications made based on Etiology*
	- Bottle/nursing caries AKA Early Childhood Caries (ECC)
	- Adolescent rampant caries
	  - Habits involving putting chocolate, toffee, biscuits in mouth to go to sleep
	- Radiation Caries
	  - Salivary glad hypofunction resulting from H&N radiation
	- Drug induced caries
	- cGVHD-related caries

Early Childhood Caries

Nursing Bottle syndrome

- Infants sleep w/ nipple of nursing bottle containing milk or sugary beverages -> Liquid pools around Max. anterior teeth
- During sleep salivary flow ↓, and clearance of liquid from the mouth ↓

Note: Mandibular anteriors not usually affected because they are covered by the tongue

Rampant Caries in Adolescents/Adults

Same etiology and pattern as ECC ^

- Habit of keeping some form of carbohydrate in the mouth and falling asleep
- Frequent snacking and taking sugary drink or food just before sleep

Drug Induced Rampant Caries
- **Meth Mouth**

Common with Methamphetamine Use…but why?

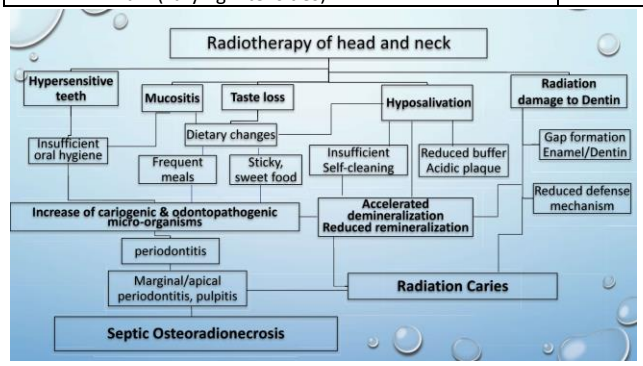
- ↓ dietary habits (↑ processed sugary foods, ↑ snacking, sugar cravings)
- Meth is an appetitie suppressant = no regular meals, just junk food snacking
- Hyposalivation
- ↓ OH

↑ Caries than age- and sex-matched non users

Usually they are coming to the dentist when they are clean -> Stay non-judgemental and be supportive

Radiation Induced

Immediate Effects	Long Term Effects
- Cellulitis - Mucositis - Dysphagia - ↓ weight - Pain (varying intensities)	- Rampant Caries - Trismus - Xerostomia - Osteoradionecrosis



Radiation Caries can start w/i 3 months of radiation completion

- Radiation and Chemo makes soft tissue very susceptible to trauma = make sure irregular teeth and sharp areas are smoothed out + Dentures fit well
- Measure max. mouth opening before radiation and frequently after rads

Extractions:

- Teeth with poor long-term prognosis that will be within the radiation field should be extracted BEFORE rads. If after Rads = ↑ risk of ORN
  - Advanced caries lesions w/ questionable pulpal status
  - Extensive PA lesions
  - Moderate – Severe Periodontal disease (Extensive attachment loss, bone loss, furcation involvement, and/or mobility)
  - Residual root tips NOT fully covered by alveolar bone
  - Impacted or incompletely erupted teeth (usually 3rd molars) not fully covered by alveolar bone
- *Ideal Timing*:
  - 3 weeks prior to radiotherapy…but that's not always possible. SO in that case:
  - Minimum healing time before Rads is 10 days for Max and 7 days for Mand.

Graft Vs Host Disease

= Complication of allogenic hematopoietic stem cell transplantation (Allo-HSCT)

- Donated bone marrow view the HOST as foreign and then attacks the body
- Occurs ~ 70 days post transplant and can continue for years

Oral Complications:

- Mucositis
- Oral Pain
- Hyposalivation
- Difficulty swallowing
- Dysgeusia
- Xerostomia

Affected Areas:

- Cervical region

Management of Rampant Caries

Clearly there are dietary issues + complete lack of OH or systemic illness

- Assessment must be comprehensive
- Identify the sources of sugar and educate to ↓ *frequency* (Especially before bedtime)

Essential components of caries management:

1. Fluoride exposure
2. Oral hygiene practices
3. Promotion of sound dietary habits
4. Restoration of the carious lesion

BONUS: Recommend chewing sugar-free gum after meals for 5-10 mins

Home Based Measures	*Oral Hygiene Habits* - Use high fluoridated toothpaste **2x daily (5000 ppm)** - Use **0.2% NaF Fluoride rinse 1x daily** (Opti-Rinse) - Diet Modifications - Xylitol sugar substitute -> $$$, and it's a diuretics…so ↑ pee breaks - Xylitol or other sugar free gum  *Antimicrobials* - 0.12% Chlorhexidine Rinse for intensive short term regimen - 15mL swish for 30sec 1x daily (Ideally before bed) for 14 day - Bedtime application is best. ↓ salivary flow keeps the drug in the mouth until morning - 14-day regiment ↓ Strep. Mutans for 12-26 weeks! = Long lasting effects **CHX interacts negatively w/ fluoride rinse: Stagger the F^- rinse in the morning and CHX in the evening** -> CHX prevents F^- binding to hydroxyapatite, therefore ↓ the F^- remineralization efficacy *Calcium-Phosphate Pastes (MI Paste / MI Paste Plus)* - Milk derived product and contains 900ppm fluoride - Big effect: Allows ↑ in Ca^{++} and PO_4^{--} to produce a supersaturated solution…this then precipitates $CaPO_4$ onto exposed dentin surface = ↓ hypersensitivity, ↑ remineralization
In-Office Measures	*3 Steps*: 1. Consultation appointment for Diet evaluation and nutritional counseling 2. F^- varnish (22,000ppm) -> probably every visit, but make sure Pt doesn't swallow it 3. Risk factors and recommendations (Tx Planning) and findings are documented **ITR (Interim Therapeutic Restoration)** - RMGIC - NEED a sound cavosurface margin to ensure good sealing -> Axially we can leave discolored dentin (Affected) as long as it isn't soft mashed potato dentin (infected) - When you notice breakdown of RMGIC = Replace it until caries risk is low and you can do a definitive resto. *RMGIC is the go to:* - Releases Fluoride - Bonds to tooth structure - Has moisture tolerance - Esthetically not too shabby - Better wear resistance vs GIC 

Rampant Caries in Esthetically Challenging Cases

Silver Diamine Fluoride (SDF)	

The Heck is it?	- $$$ aqueous, colorless solution -> Used as a Topical Agent
	- Contains 38% Ammonia + Silver Fluoride (AgF) -> 44,800ppm F^-
	  - Ammonia stabilizes AgF in solution -> Forms complex and stable ion
	  - AgF = Active agent
	When Applied:
	- Silver-proteins conjugate layer forms on tooth = ↑ resistance to acid dissolution & bacterial enzymatic metabolism
	- ↑ mineral density and hardness of tooth

Effects	- Reacts w/ calcium and phosphate ions = Fluorohydroxyapatite (↓ solubility vs Hydroxyapaptite) *Effects*: - Bactericidal to cariogenic bacteria (mainly Streptococcus mutans) - Inhibits growth of cariogenic biofilms - Remineralizes the demineralized enamel or dentin - ↓ mineral loss of demineralized enamel and dentin - Inhibits collagenases (MMP's + cystein cathepsins) = protects dentin collagen from demin. - Forms highly mineralized surface (↑ Ca, ↑ PO_4) on arrested lesions *Dose-response relationship = More frequent applications = ↑ caries arrest rate** NOTE: If tooth is symptomatic, partially necrotic or pulpally involved, SDF might not be beneficial

Side Effects	- Blackening of treated lesion
	  - Be sure to show Pt. picture of SDF Tx during discussion so they know how it will look
	  - Lesions darkens over 1 week
	- Bitter metallic Taste (Short term)
	- Staining of soft tissues (Temporary)
	- Staining of clinical surfaces and treatment trays
	   + Crowns = 

S.M.A.R.T Method	SDF Modified Atraumatic Restorative Technique
	  - Place SDF + Glass Ionomer Cement/ RMGIC over top at same appointment
	  - Combine synergistic compatibilities of SDF + RMGIC
	
	Clinical Applications:
	1. Multiple applications of SDF followed by RMGIC sealant/restoration after lesion arrests
	2. Single SDF application w/ immediate RMGIC sealant/restoration
	3. Arrest *Secondary* caries w/ SDF, then repair w/ RMGIC

Tx Options for Pt who is not likely to return

1. Not placing SDF (do RMGIC or something instead)
2. Place SDF only once understanding they might not come back for subsequent applications
3. S.M.A.R.T Method
   - Place SDF + Glass Ionomer Cement/ RMGIC over top at same appointment

Pros of SMART	Cons of SMART
- SDF Kills Bacteria - RMGIC ↑ esthetics - RMGIC releases fluoride (so does SDF) - RMGIC seals the lesion	- If prep is shallow, black SDF will show through the thin RMGIC (Get consent) - Not a definitive Tx. Just a bandaid until caries risk is low

Implants

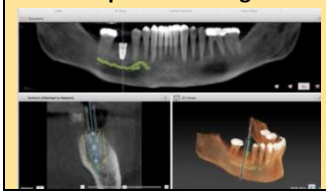
Single Tooth Implants (Lecture not given, notes handout sucks ass)

Rational for Implants	- Preservation of sound tooth structure (Avoids bridging, risky posts and cores) - Preservation of alveolar bone (prevent bone resorption by providing stimulation) - Provision of additional support (for dentures etc, ↓ load on remaining dentition) - Resistance to Disease

Posterior Implant Restorations

Diagnosis and Prosthetic Tx Planning

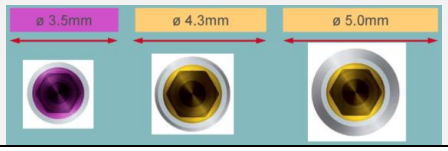
4 important tools to use:

Diagnostic Models	*Evaluate*: - Intercuspal position - Edentulous ridge relationship to adjacent teeth, opposing teeth and opposing ridge (Tipping, Extrusion etc) - Inclination, Rotation, Extrusion, Alignment of remaining teeth - Soft Tissue, Gingival heights - Interarch space (between teeth) *Determine*: - Options for occlusal schemes - Ideal # and position of implants - Direction of forces to which future implants would be subject (Extrusions etc)
Radiographs (Not CBCT)	*Evaluate*: - Amount of Bone available (2D images) -> NOT volume - Angulation of adjacent teeth - Location of anatomical structures - Sinuses, Mandibular Canal, Mental Foramen
CBCT Scans 	Provides reconstructed 3D images of the patient's anatomy - Able to give us the VOLUME of bone available - Not useful for Soft tissue
Implant Planning Software 	Assesses CBCT data (Volume of bone) to determine: - Do we need bone grafting? - Position of implant

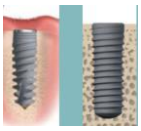
Restorative Solutions for missing Posterior Teeth

1. Partial Removable Dental Prosthesis
   - More beneficial if there are several teeth in the same arch -> Cost effective (vs many implants)
2. Fixed Dental Prosthesis (Bridge)
3. Single Posterior Implant
   - Less invasive vs FPD -> don't need to prep adjacent virgin teeth
   - If Adjacent teeth are already crowned or have large resto's then if might not be such an easy decision

Treatment Planning

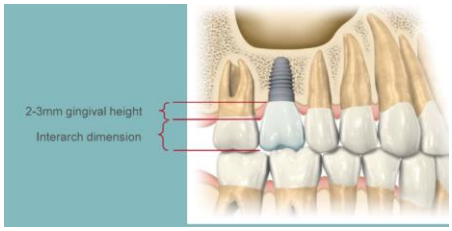
<table>
<tr><td>Space Needed for Implant</td><td>Measure the space you have (edentulous space) -> Then start subtracting
- Width of implant itself
- Space needed on either side of the implant
- Buccal bone available -> VERY CRITICAL. As we lose buccal plate = recession. Need bony support for ST around the implant
Different sizes of implants:
 
Space around the implants:
- 1.5mm btwn implant and adjacent tooth
- Minimum 2mm buccal bone -> for ST support
  </td></tr>
<tr><td>Surgical Guides</td><td><u>To fabricate a guide, you will need:</u>
- Models
- Import wax up scans of the restoration helps us plan the implant angulation
- Radiographs
- CBCT Scans
- Can overlay scan data of diagnostic casts or intraoral scans in the planning software

<u>Benefits of a surgical guide:</u>
- More precise placement of implant
- Preservation of anatomic structures
- Shorter Tx times (surgery times specifically)
- Less invasive flapless surgery -> So less chance of swelling
- Flapless isn’t necessarily good though. ↑ risk of perforating the B or L plate
- ↑ post-operative strain on dentist and patient

However its more technique sensitive, and you need to ensure proper irrigation through the guide hole</td></tr>
<tr><td>Different Implant surgeries</td><td><u>One-stage delayed function</u>
 
- Healing abutment are placed through the soft tissue. ST is sutured around the healing abutment
- Lots of different types of healing abutments (Flared and Straight) -> Depends on the healing you are wanting
- Flared: Pushes tissue out
- Straight: Saves tissue
 
<u>Two-stage delayed function</u>
 
- Cover screw placed and soft tissue is sutured and heals over
- Better option if bone quality isn’t so good and you want to allow ↑ time for osseointegration
- Need second surgery to expose the implant again

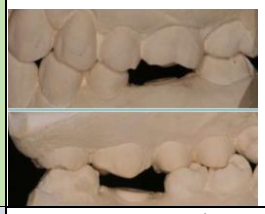
<u>One-stage immediate function</u>
 
- Temporary restoration placed with immediate function
- Might not be fully intercuspal function, but it is still being loaded by muscles in the mouth
- Need it to be REALLY stable (torqued to 35Ncm’s)</td></tr>
</table>

Guidelines for Restoration Selection

<table>
<tr><td>Issues to be considered</td><td>- Implant-abutment connection
- Distance from implant platform to bone crest
- Interocclusal distance
- Depth of peri-implant soft tissues
- Biotype of the tissue
- Emergence Profile
- Shape and contour of the tissue
- Screw-retained/cement-retained
- More interocclusal space for cement retained crowns -> More components and more resistance form
  </td></tr>
</table>

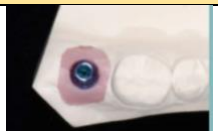
Screw Retained Restorations


-> Keep in mind the different esthetics of the screw access channel (↓ esthetics vs the rest of the crown). Also harder to get a perfect occlusion

Indications	- Limited interarch dimension - Patient is a bruxor - Retrievability is wanted - Cement-free solution is wanted  Can't create an abutment tall enough + Crown thick enough w/o compromising either strength or retention -> Cement retained is not a great option *Screw retained is ideal if there is <5mm interarch dimension*
Materials and Manufacturing	1. Cast Metal 2. Cast Metal Ceramic 3. Milled Layered Zirconia 4. Milled Monolithic Zirconia 5. Milled Metal Ceramic 
Angled Screw Channels	Allows for minor correction of poor implant placement when fabricating screw-retained crowns - Can also improve access to the screw and screw channel in posterior areas  *Needs DIFFERENT abutment screws and drivers -> You risk stripping the screw if you have the wrong driver…Always assess the screw head*

Cement Retained Restorations

Prefabricated Stock Abutment

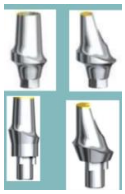
Guidelines:
- Ideal Gingival Height -> 1-3mm
- Ideal Interarch dimensions (5-10mm)
- Flat tissue architecture

NOT ideal for porcelain support though. Tend to get overhung porcelain the is unsupported by the abutment -> Sketchy

Snappy Abutment -> Makes for easy impression

Pre-Fabricated Customizable Titanium Abutment

= Premade scalloping on the gingival aspect of the abutment



- Pick a shape that matches the soft tissue contours best
- Can ask the lab to make adjustments -> ↓ chairside adjustments
- Corrects minor angulation problems
- Fixture level impressions
- Easy to cement

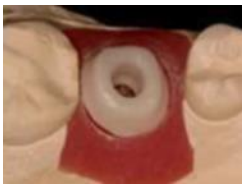
Indications
- Single and multiple unit implant restorations
- Cement-retained

Doesn't get rid of the questionable support of the porcelain

Custom Individualized Abutment

Indications:
- Scalloped tissue architecture
- Thick soft tissue
- Angled implant placement
- Excessive interarch dimension
- Excessive interproximal dimension

Pros:
- Can create best emergence profile
- Better Ceramic support
- Better cleansable interproximally
- Best gingival margin placement

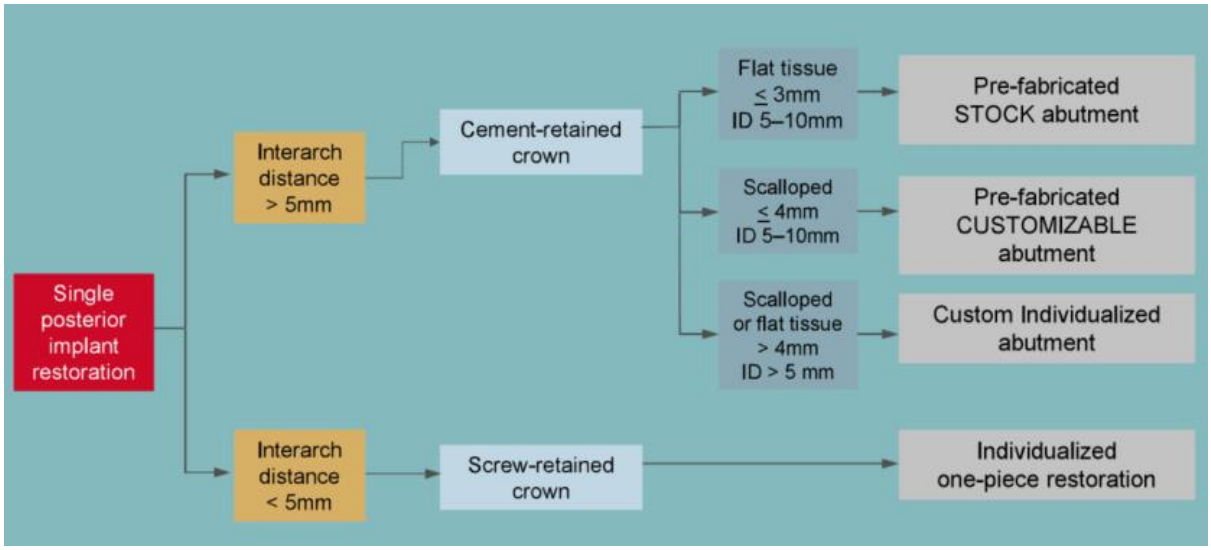


Fabrication Options:
1. Milled abutments -> Zirconia or Titanium
2. Castable Abutments -> Gold, or other noble alloys

w/ developments in CAD/CAM software its not really that much cheaper to use a stock abutment, so not worth the shittiness, go for Custom Individualized Abutment if Cementing

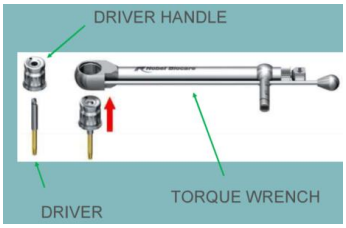
For Practical Purposes:

- If Cement Retained -> Go for the Custom Individualized Abutment
- Or just go with Screw Retained if you can



	Advantages	Disadvantages
Screw Retained	- Retrievable - Limited Interocclusal Space (≤ 4mm) - Better tissue response w/ provisional resto's - Can be used for deep implant placement (avoids cement trap)	- Requires ideal implant placement - Difficult access in posterior (especially w/ limited opening) - Can be more expensive - Passive fit is more difficult to achieve - Harder to get perfect occlusion (Screw Hole) - Higher risk of screw loosening
Cement Retained	- Can restore non-ideally placed implants - More ideal for esthetics and occlusion - Easier to get a passive fit - Easier to make the provisionals - Less Expensive	- Irretrievable w/ permanent cement (even hard with temp) - May be difficult to remove w/ provisional cement - Req/ more interocclusal space (>5mm) - Excess cement can cause issues (peri-implantitis)

Prosthetic Kit



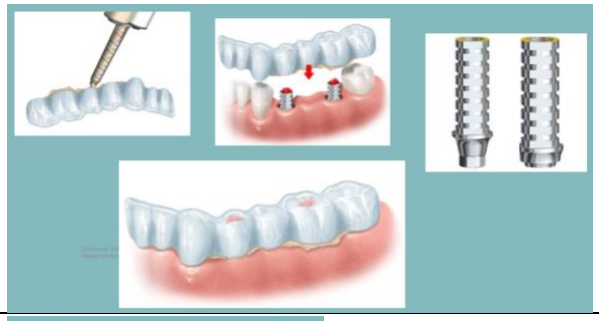
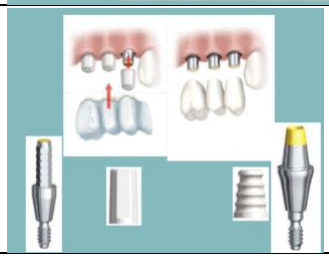
When Torqueing: Place light pressure on the driver handle to keep it seated -> ONLY torque by pushing on the flexible arm. This prevents too much force.

- Pretty much all large abutment screws are torqued to 35 Ncm. Push the flexible arm until it reaches that mark

**Do not Torque temporary things: Healing Abutments, Temp abutments etc, these are all hand tightened

Temporization Posterior Implant Crowns

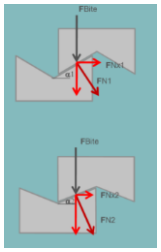
- Usually we only temp anterior cases

Screw Retained		- Use pre-fab. Titanium temporary abutments -> Place red wax on the top so you can find the Screw Access hole through the temp material
Cement Retained		Temporary Copings: - Quick temp solution to place on abutments - Ideal for immediate function

Occlusion and Biomechanics

During malocclusion -> Forces act perpendicular to the plane of contact. If this is too strong a force you will get a restoration fracture, and possibly crestal bone loss

- Implants should be placed so the biting forces are directed straight down onto the implant
- No premature contacts with light occlusal contact
- Avoid cantilevers
- Keep the occlusal table narrow



Cuspal Inclines

- The steeper the line of contact, the stronger the resulting force
- Keep occlusion shallow or flat to ↓ lateral forces impacting the occlusion

Possible consequences of overload	- Crestal Bone Loss - Dislodged Resto's - Screw Loosening - Screw Fracturing - Restoration or Ceramic Fracture - Peri-implantitis - Implant Failure