

ORTHO 430 STUDY REVIEW

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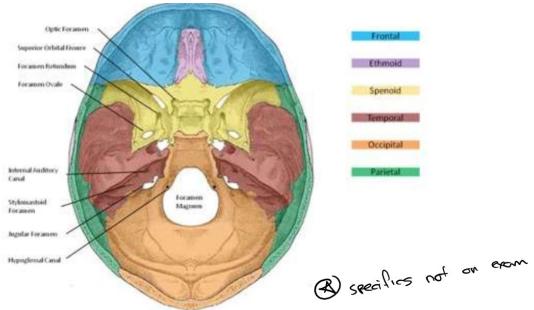
**Notes Missing for (no handouts given):

- Tooth Number and Size and Malformed 1st Permanent Molars

Cranial Base and Midface

Significance of Cranial Base	<ul style="list-style-type: none"> - Landmarks relatively easy to ID on cephalometric Radiograph - Used to relate the position of Maxillary, Mandibular and Dental Landmarks for Dx - Landmarks are relatively stable during juvenile and adolescent ages (~7 yrs +) - Superimpose stable landmarks over 2 images to compare growth changes
Cranial Base growth Sites (Post Natal)	<ul style="list-style-type: none"> - Spheno-ethmoidal synchondrosis - Spheno-occipital synchondrosis - Surface apposition and resorption

The Cranial base (AKA Floor of the brain) is connected to the midface



Made from Cartilaginous Bone via **Endochondral Ossification**

- Growth happens from Synchondroses (cartilaginous structures between ossifying structures) -> As bones expand closer together eventually the synchondroses between 2 bones fuse and ossify, ending the growth between those bones
- Anterior Cranial Base growth stops ~ 7 years old -> Good candidate to reference growth off of!

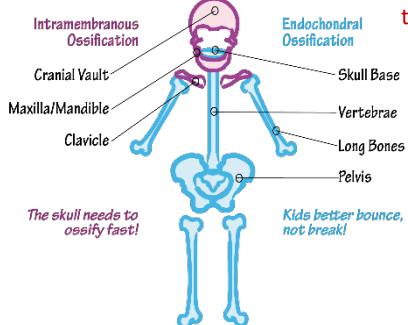
Classic Exam Q:

What is the difference between Synchondroses and Sutures?

Synchondrosis -> Bones are joined by hyaline cartilage.
Found in the epiphyseal plates of bones growing via **Endochondral Ossification**

Sutures -> Found only in the skull. Possess short fibres of connective tissue that holds the skull bones tightly in place.
Found between bones of the skull that grow via **Intramembranous Ossification**.

Intramembranous vs. Endochondral



** The Jaw and Skull are intramembranous Ossification EXCEPT the cranial base**

- When **Synchondrosis** fuse too early and ossify before growth should be completed = **Achondroplasia** (Dwarfism)
-> Results in a short cranial base and short long bones

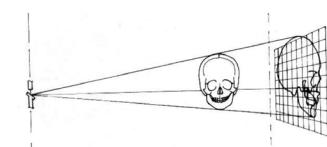


Cephalometry

= measurement and study of the proportions of the head and face, especially during development and growth

- Full head radiograph (usually taken from a Sagittal profile, and a Frontal Profile)
- **Inherent error with all Radiographs = 3D object compressed into a 2D image**
- Important that Sensor placed as close as it can be to the object (Head) to prevent image distortion/magnification that would need correction

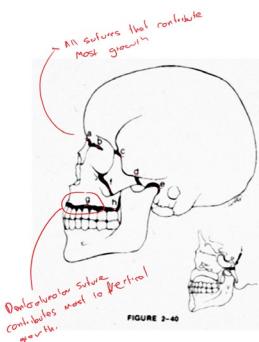
Important that all Cephalographs are taken from a standardized position -> **Based off of External Auditory Meatus**



Sagittal View (Lateral Cephalogram)		Useful for Monitoring growth overtime by superimposing static structures in the anterior cranial base <i>Na, S and Ba</i> are typically the landmarks to superimpose
Frontal Cephalogram		Useful for assessing symmetry between R and L sides

Growth Patterns and Super Impositions

Dentoalveolar suture contributes the most to the vertical growth of the face



Interesting Note:

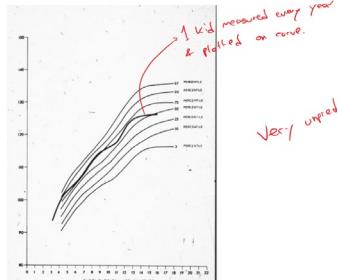
Early appliances in Europe focused on full jaw movement to fix ortho problems (Functional Regulator). Americans approached it with a tooth related solution, fixing tooth position with braces instead.



Superimpositions	What it monitors
Anterior Cranial Base	Typically superimposing Na, S, and Ba landmarks <ul style="list-style-type: none"> - Assesses Jaw growth overall
	
Growth Patterns	
Midface and Maxillary	<ul style="list-style-type: none"> - Downwards and Forwards (more down than forward though) - Slight rotation relative to cranial base - Sutures in midface adjust for changes with growth - Surface bone changes due to surface apposition and resorption - Dentoalveolar bone growth related to tooth eruption contribute to vertical growth of the face
Mandibular	<ul style="list-style-type: none"> - Grows from the back and pushes jaw forward - Back, Front and Alveolus all have different growth patterns

Growth is very unpredictable. We take measurements and plot them in population curves...but need to ensure the population is as representative of the patient as possible. Can't plot an Asian boy from Richmond on the curve of Sudanese tribesmen.

- Historically they have taken radiographs and measured every year to make an individual curve, but that is unethical and dangerous now (ALARA PRINCIPLES MAN)



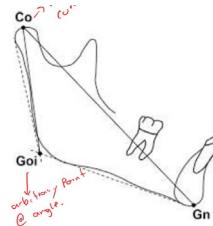
Mandibular Growth

Mandible formed from Intramembranous Ossification -> Meckles cartilage only contributes 1 small portion to the Mandible

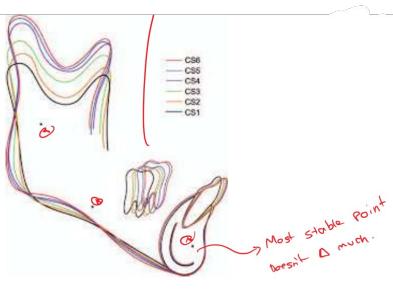
(**condyle**) so overall, we consider it Intramembranous

Mandibular measurements are typically done from 3 points:

- **Co (Condyle)** -> An arbitrary point along the Condyle curve (Very inaccurate)
- **Go (Gonion)** -> An arbitrary point along the angle of the mandible (Very inaccurate)
- **Gn (Gnathion)** -> Most outward and everted point on the profile curvature of the symphysis

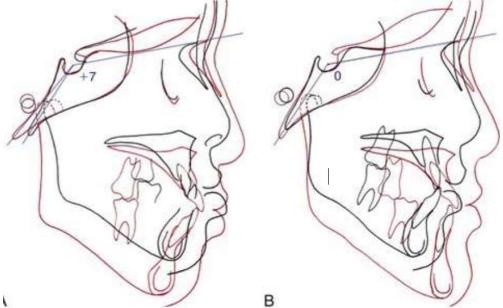


Most Mandibular Growth happens at the back!



- **Bjork Implant Technique** helped determine this: Inserted metallic implants in certain places of the jaw and monitored their movement on radiographs over time.

- o Found **Growth at the ramus of the mandible**, and the most stable point is at the **Gn** (mental area of the mandible)
 - o Molars move Mesially (Forward) -> Can make crowding worse, OR close the space formed from permanent premolars replacing larger Primary Molars (Leeway space)



**** Mandibular Growth happens both vertically, but also rotationally**** -> Makes it impossible to predict. How much is it going to grow overall? And How much is it going to grow in each direction? -> We don't really know and can't reliably predict

Summary

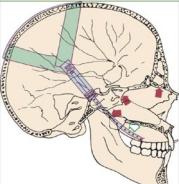
- Prepubertal Growth Spurts: Boys = 12-15, Girls = 11-14
- Cessation of growth: Boys = 19, Girls = 17
- Difficult to predict accurately for a specific individual
- Can't predict discrepancies before the estimated growth spurt in the hopes to change it in the next few years while growth still occurs
- Cannot stimulate extra mandibular growth
- Dentoalveolar movement accounts for the corrections of Class II malocclusion, not Jaw movement

Clinical Significance of CF Growth and Development

1. Orthodontic Vs Orthopaedic Manipulation -> Orthopaedic is very hard to do because the Sutures stop growing (the old school euro way, the Americans like the Orthodontic Manipulation which seems to work better)
 - a. Guidance Vs. Construction & Stimulation
 - i. Dental Intrusion Vs Extrusion (Orthodontic manipulation)
 - ii. Maxillary Constriction vs Stimulation
 - iii. Mandibular Constriction vs. Stim
 - iv. Maxillary Rotation
 - v. Mandibular Rotation

Not really done, Controlling Jaw growth is too tricky

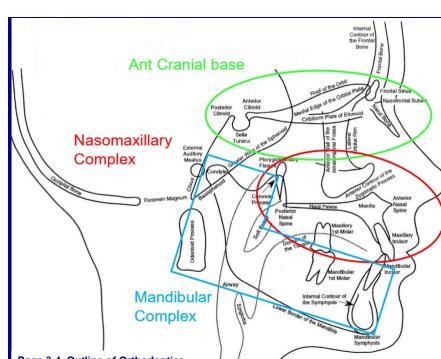
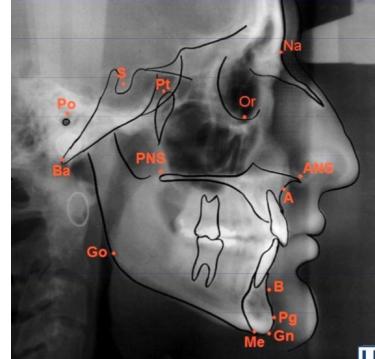
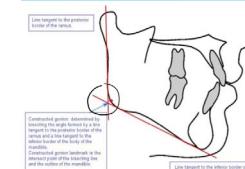
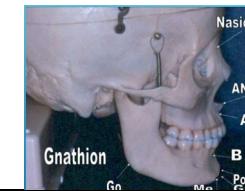
Appliances

Old school headgear 	<ul style="list-style-type: none">- Designed to pull the Maxilla up and back to fix Class II
Twin Block 	<p>Forces mandible forward using opposing inclined planes</p> <ul style="list-style-type: none">- Repositions the jaw, Teeth grow into this new position and eventually hold the jaw there in their new ICP
Herbst Appliance 	<p>These function similar to the Twin block, but use the American concept of braces to attach the appliances instead of having a removable appliance</p> <ul style="list-style-type: none">- Better patient compliance, and faster results because it is always working (not just overnight when the patient wears it)
Forsus Appliance 	

Cephalometric Analysis

Tracing a Ceph

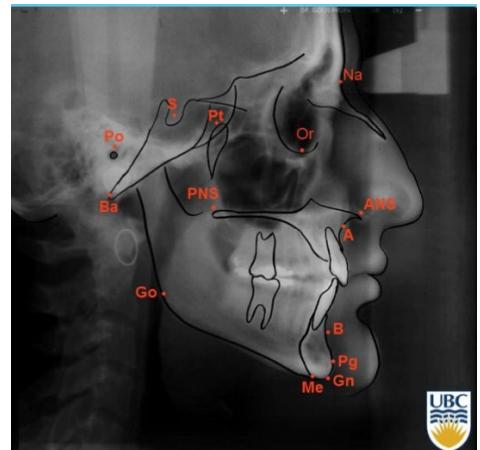
- Broken up into 3 complexes: *Anterior Cranial Base, Nasomaxillary Complex, Mandibular Complex*
- Within these complexes we trace landmarks that we will compare against each other to determine the relationships -> Lucky for us, the computer traces it all, and gives us all the values to interpret

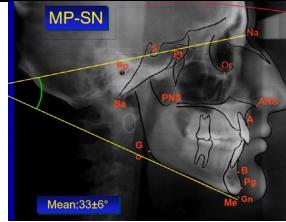
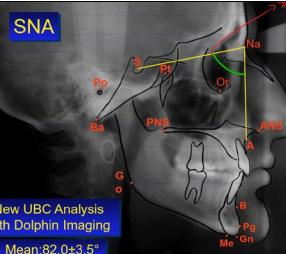
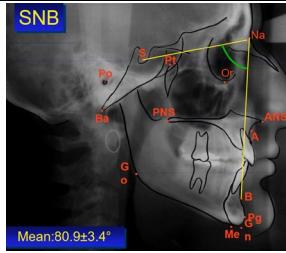
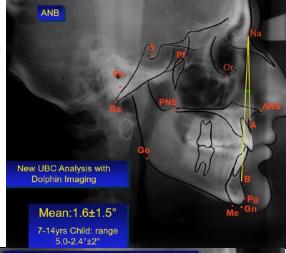
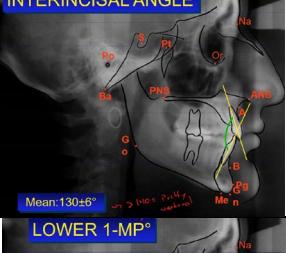
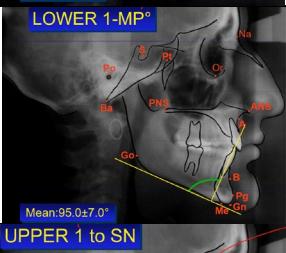
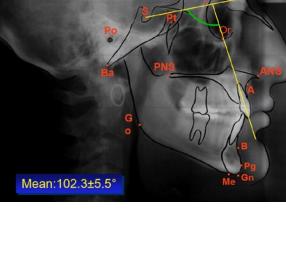
Structures	Tracings
<ul style="list-style-type: none"> - Sella Turcica - Nasal Bone - Anterior Nasal Spine - Nasion - Frontal Bone - Maxilla - Mandible - Orbital Bone - U/L Incisors - U/L 1st molar - Facial Profile/Soft Tissues - Occipital Bone-Posterior Cranial Base 	 
Nasion (Na) Anterior Nasal Spine (ANS) A Point B Point Porion (Po) Gonion (Go) Gnathion (Gn) Menton (Me) Pogonion (Pog)	<ul style="list-style-type: none"> - Most anterior point on the frontonasal suture - Most anterior point on maxillary bone - Point of the deepest concavity anteriorly on the Maxillary Alveolus - Point of the Deepest concavity anteriorly on the Mandibular symphysis - Upper midpoint on the external auditory meatus - Most posterior, Inferior point on the mandibular angle <ul style="list-style-type: none"> - Can be produced by bisecting the angle formed intersecting mandibular plane + Ramus of the mandible - Most anterior, Inferior point on the mandibular symphysis <ul style="list-style-type: none"> - Perpendicular on the mandibular symphysis. Midway btwn Pogonion and Menton - Most inferior point on the mandibular symphysis - Most anterior point on the mandibular symphysis  

Planes and Relationships

Goal is to evaluate the relationships (Horizontally and Vertically) of 5 major components of the face:

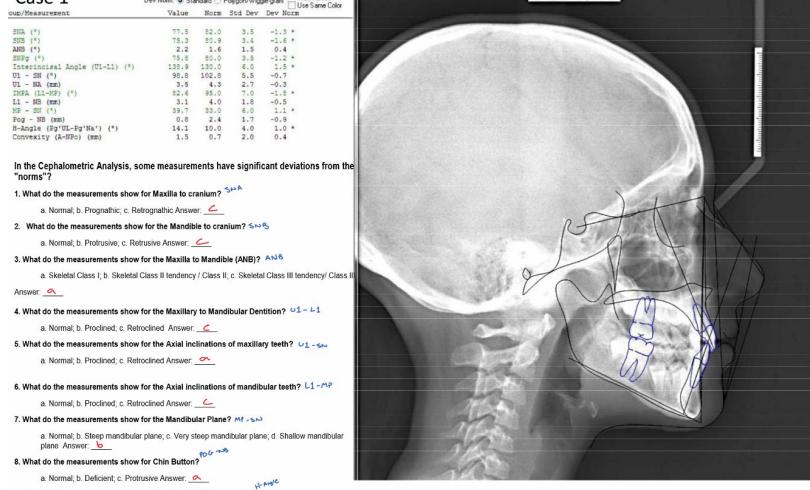
1. Cranium + Cranial Base
2. Skeletal Maxilla
3. Skeletal Mandible
4. Maxillary dentition and Alveolar process
5. Mandibular dentition and alveolar process



SN Line	Line through nasion and sella	
Frankfort Plane	Line through Orbital Bone and Porion (Upper midpoint on external auditory meatus)	
MP-SN (33)	Mandibular plane in relation to Cranial Base <ul style="list-style-type: none"> - If it is especially steep or flat it is very hard to Tx - > angle produces a tendency for anterior open bite <p><u>Interpretation:</u></p> <ul style="list-style-type: none"> - 2+ Std Dev off = Very steep - 1 Std Dev off = Steep - Above the mean = Vertical Growth - Below the Mean = Horizontal Growth 	
SNA (82)	Angle -> Relative Antero-posterior position of maxilla to the cranial base <p><u>Interpretation:</u></p> <ul style="list-style-type: none"> - Greater than Mean = Maxillary Protrusion - Less than mean = Maxillary Retruson 	
SNB (81)	Angle -> Anterio-posterior position of the mandible to the cranial base <p><u>Interpretation:</u></p> <ul style="list-style-type: none"> - > Mean = Mandibular Prognathism - < Mean = Mandibular Retruson 	
ANB (1.6)	Angle -> Anterioposterior position of Maxilla to the Mandible (Used to determine skeletal Class) <p><u>Interpretation:</u></p> <ul style="list-style-type: none"> - > Mean = Skeletal Class II - < Mean = Skeletal Class III 	
Inter-Incisor Angle (U1-L1) (130)	Angle -> Between long axis of Max incisors and Mand Incisors <p><u>Interpretation:</u></p> <ul style="list-style-type: none"> - Greater than Mean = Retroclined/Vertical - Less than the Mean = Proclined 	
Mandibular Incisal Inclination (L1-MP) (95)	Angle -> Between Mandibular plane and long axis of Man Incisor <p><u>Interpretation:</u></p> <ul style="list-style-type: none"> - > Mean = Proclined - < Mean = Retroclined 	
U1 – SN (102)	Angle -> Long axis of Max Incisor to Cranial Base <p><u>Interpretation:</u></p> <ul style="list-style-type: none"> - > Mean = Proclined - < Mean = Retroclined 	

U1-NA(mm) (3mm)	Distance from Max Incisor tip to A point <u>Interpretation:</u> - > Mean = Protrusion - < Mean = Retruson	
L1 – NB (mm) (4mm)	Distance from Man Incisor tip to NB Line <u>Interpretation:</u> - > Mean = Protrusion - < Mean = Retruson	
Pog-NB (mm) (1mm)	Distance from Pogonion to B Point (How much does chin stick out) <u>Interpretation:</u> - > Mean = Prominent chin button - < Mean = Deficient chin button	
SN – Pog (80)	Angle -> Between most anterior of the chin (hard tissue) and the cranial base <u>Interpretation:</u> - > Mean = Mandibular Prognathism - < Mean = Mandibular Retruson	
H-Angle (Pog'UL -Pog'Na')	' = Soft Tissue - Soft Tissue Pog (chin) to Upper lip soft tissue and Soft Tissue Pog to Soft Tissue Na <u>Interpretation:</u> - > Mean = Convex Profile - < Mean = Concave Profile	
Overjet	Distance from Max Incisor top to Man Incisor Tip - Horizontal Relationship	
Overbite	Distance of overlap/coverage of the Upper Incisor tip over the Mandibular Incisor - Vertical Relationship	

Case 1



Analysis Methods

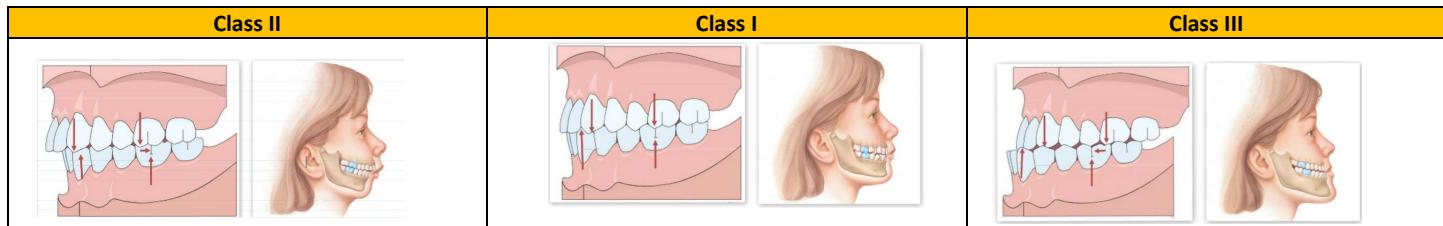
There is a long list of ways to analyse Ceph's with random people names (Tweed's is a personal favorite) but we only need to know 2 (Sadly Tweed's isn't one of them 😞):

- McKee Analysis
- ABO Analysis

Both of these largely analyse the same things, but McKee takes a look at some more things that ABO doesn't:

- Lengths of Max/Mand, Vertical Dimension

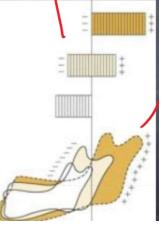
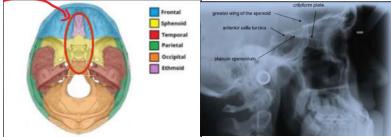
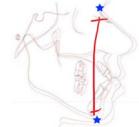
ABO Analysis					McKee Analysis				
Maxilla to Cranial Base SNA ($^{\circ}$)					Maxilla Skeletal SNA ($^{\circ}$)				
76.0 82.0 3.5 -1.7 *					76.0 82.0 3.5 -1.7 *				
Mandible to Cranial Base SNB ($^{\circ}$)					Maxillary Skeletal (A-Na Perp) (mm)				
74.2 80.9 3.4 -2.0 **					-2.1 0.0 3.1 -0.7				
SN - MP ($^{\circ}$)					Midface Length (Co-A) (mm)				
37.6 32.9 5.2 0.9					80.0 92.8 4.0 -3.2 ***				
FMA (MP-FH) ($^{\circ}$)									
28.2 24.0 4.5 0.9									
Maxillo-Mandibular ANB ($^{\circ}$)					Mandible Skeletal				
1.8 1.6 1.5 0.1					SNB ($^{\circ}$)				
Maxillary Dentition U1 - NA (mm)					74.2 80.9 3.4 -2.0 **				
U1 - SN ($^{\circ}$)					Mand. Skeletal (Pg-Na Perp) (mm)				
96.2 102.8 5.5 -1.2 *					26.4 24.6 4.0 0.4				
Mandibular Dentition L1 - NB (mm)					Wits Appraisal (mm)				
L1 - MP ($^{\circ}$)					-2.3 -1.0 1.0 -1.3 *				
84.9 95.0 7.0 -1.4 *					Convexity (NA-Apo) ($^{\circ}$)				
Soft Tissue Lower Lip to E-Plane (mm)					2.9 5.2 3.0 -0.8				
Upper Lip to E-Plane (mm)									
-2.7 -2.0 2.0 -0.3					Maxilla Dentoalveolar				
-5.2 -5.7 2.0 0.3					U1 - SN ($^{\circ}$)				
					96.2 102.8 5.5 -1.2 *				
					U1 - PH ($^{\circ}$)				
					108.2 111.0 6.0 -0.5				
					U1 - Palatal Plane ($^{\circ}$)				
					110.2 110.0 5.0 0.0				
					U1 - NA ($^{\circ}$)				
					20.2 22.8 5.7 -0.5				
					U1 - NA (mm)				
					3.0 4.3 2.7 -0.5				
					U-Incisor Protrusion (U1-Apo) (mm)				
					4.0 6.0 2.2 -0.9				
Mandible Dentoalveolar					Vertical Dimension				
IMPA (L1-MP) ($^{\circ}$)					IMPA (MP-EU) ($^{\circ}$)				
19.4 25.3 6.0 -1.0 *					27.8 24.0 4.5 0.8				
L1 - NB (mm)					SN - GoCn ($^{\circ}$)				
3.3 4.0 1.8 -0.4					37.1 32.9 5.2 0.8				
84.9 95.0 7.0 -1.4 *					UWF/FFH (N-ANS:N-Me) (%)				
					46.4 45.0 3.0 0.5				
					LWF/FFH (AMS-Me:N-Me) (%)				
					53.6 55.0 3.0 -0.5				
					P-A Face Height (S-Go/N-Me) (%)				
					60.4 65.0 4.0 -1.2 *				
					U6 - PP (UPDH) (mm)				
					22.7 23.0 2.0 -0.2				
					LL - MP (LADH) (mm)				
					38.2 40.0 2.0 -0.9				
					LG - MF (LFPH) (mm)				
					29.6 31.0 2.0 -0.7				
Soft Tissue					Vertical Dimension				
Upper Lip to E-Plane (mm)					IMPA (MP-EU) ($^{\circ}$)				
-5.2 -2.0 2.0 0.3					27.8 24.0 4.5 0.8				
Lower Lip to E-Plane (mm)					SN - GoCn ($^{\circ}$)				
-2.7 -2.0 2.0 -0.3					37.1 32.9 5.2 0.8				
Nasolabial Angle (Col-Sn-UL) ($^{\circ}$)					UWF/FFH (N-ANS:N-Me) (%)				
123.6 102.0 8.0 2.7 **					46.4 45.0 3.0 0.5				
Facial Convexity (G'-Sn-Po') ($^{\circ}$)					LWF/FFH (AMS-Me:N-Me) (%)				
14.5 12.0 2.0 1.3 *					53.6 55.0 3.0 -0.5				



Goal of Cephs	Help figure out what is causing an ortho problem -> Assess vertical + horizontal relationships of 5 functional components of the face: <ol style="list-style-type: none"> 1. Cranial Base 2. Maxilla 3. Mandible 4. Maxillary alveolus / Teeth 5. Mandibular alveolus / Teeth <p>*Also relate to population norms or itself over time*</p>
Importance of Cephs	<ul style="list-style-type: none"> - Determine underlying etiology of malocclusion (Skeletal Relationships) - Answer questions that study casts cannot answer -> Incisal inclination for ex - Provide dDx of Class II and III malocclusion <ul style="list-style-type: none"> - Class II: Upper too protruded? Mand too small? Mand too large and rotated down? -> Don't want to change the maxilla if the mandible is causing the problem. - Give indication of future pattern of craniofacial growth - Predict timing of max. growth

Why do we use Superimpositions?

(Exam Q)

<p>1. Determine how the teeth and jaws are moved over the course of a Tx</p>	<p>Assessed at a few levels:</p> <ul style="list-style-type: none"> - <u>Overall</u>: Cranial Base relation - <u>Regionally</u>: Maxilla and Mandible <p>Inner border or ramus resorbs as back border grows out</p> <p>*Requires a stable reference point that has stopped growing**</p> <p><u>Cranial base stops growing after age 7:</u></p> <ul style="list-style-type: none"> - Anterior wall of Sella - Greater wing of Sphenoid - Cribiform Plate - Ethmoid Crest <p><u>Maxillary Stable Structures:</u></p> <ul style="list-style-type: none"> - Anterior surface of Zygomatic process - Nasal and Orbital floors <p><u>Mandibular Stable Structures:</u></p> <ul style="list-style-type: none"> - Anterior-Inferior contour below Pogonion - Inner Contour of Cortical plate (at lower border of symphysis) - Contours of alveolar crest - 2nd, inferior outline of 3rd molar (prior to root formation) 	   
<p>2. Timing of Tx</p>	<p>If you treat before the Pt is done growing, then all of your work will be for nothing when they grow through it</p>	
<p>3. Determine the cessation of growth</p>	<p>*Most relevant for general practice when placing implants*</p> <ul style="list-style-type: none"> - Normally as jaw grows, the teeth will move with the alveolar process in unison -> Implants don't move though. So over time as everything is growing around them implants will look like shit and can cause problems <p>** Gold Standard**</p> <ul style="list-style-type: none"> - Serial ceph's taken at least 6 months apart -> <u>Nasion-Menton distance</u> should not be changed when growth has stopped 	 

Facial Esthetics and Orthodontics

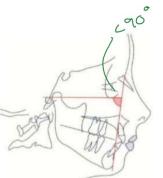
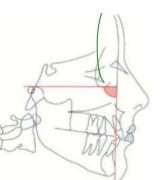
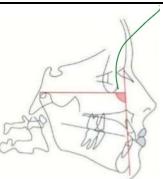
Facial Esthetics is very subjective and is dependant on 3 factors: **Temporal, Cultural, Stylistic**

Profile Type		
For the extreme cases they have to break the jaw, reposition it, and then do ortho to move the teeth into their new occlusion		
Convex	 Convex	<p>2 things could be the issue here:</p> <ul style="list-style-type: none"> - Max is too big, OR - Mand is too small <p>*Class II Malocclusion*</p>
Straight	 Normal	<p>Still kind of mild convex</p> <ul style="list-style-type: none"> - Associated with Class I occlusion
Concave (Least Common)	 Concave	<p>2 things could be there issue here:</p> <ul style="list-style-type: none"> - Max is too small - Mand is too big <p>*Class III Malocclusion*</p>

Facial Type

Very similar to profile type but it comes from a ceph -> relating Mandible (Pog-Na) to Frankfurt Plane

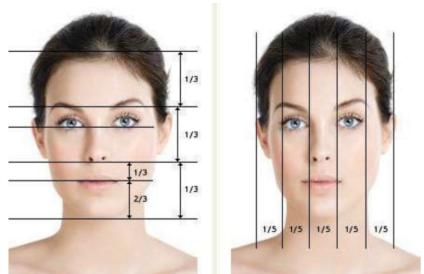
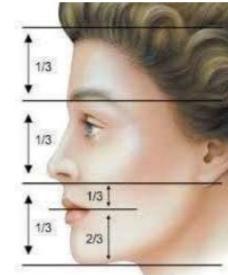
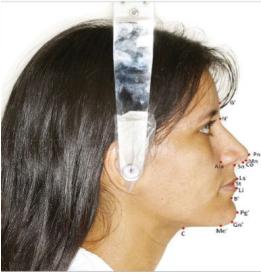
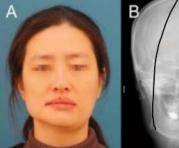
- "The fact of the matter is" that it's really just a chin position metric

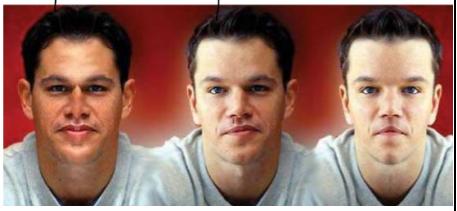
Retrognathic	  <p>$<90^\circ$ angle formed between Frankfurt plane and Pog-Na line</p> <p>Convex profile type</p> <ul style="list-style-type: none"> - Recessive chin
Orthognathic	  <p>$\sim 90^\circ$ angle</p> <p>Straight profile type</p> <ul style="list-style-type: none"> - Normal chin
Prognathic	  <p>$>90^\circ$ angle</p> <p>Concave profile type</p> <ul style="list-style-type: none"> - Protrusive chin <p style="text-align: right;"><small>True Prognathism (when mandible is large)</small></p> <p style="text-align: right;">\rightarrow When Mandible is too large = true prognathism</p>

Classic Exam Q is to ask what the persons Profile type is

Extra Oral Esthetics

Assess:

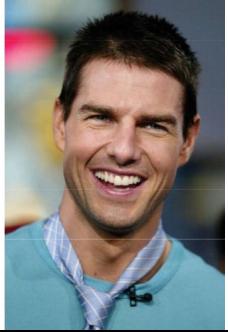
Proportions	
Frontal	<p>Split into Horizontal 3rds, and Vertical 5ths</p>  <p>Classic exam Q:</p> <ul style="list-style-type: none"> - What are the facial proportions? -> Middle 3rd is too large etc.
Sagittal	<p>There are a bunch of sagittal landmarks we assess -> Don't need to know them though 😊</p>  
Symmetry	
Mandibular	<p>A  B </p> <ul style="list-style-type: none"> - One side of the jaw didn't grow as much as the other

		<p>-> Midlines were not coincident and there was an obvious mandibular asymmetry - Did ortho and moved teeth (fixed the midline issue) but the jaws are still not in line. Would need to break the jaw and align it.</p>
		 <p>**Turns out though that perfectly symmetrical faces are unnatural looking, so we aren't really trying to create that -> Otherwise you will look weird, like Symmetric Matt Damon **</p>

Cultural and Subjective Standards

Nose Shape	- Nicole Kidman Nose
Lip Fullness	- Angelina Jolie Lips

Intraoral Esthetics

Buccal Corridors	 <p>Black tunnels on either side of the smile -Some people think this is considered a problem....</p>
Midline Asymmetry	 <p>Tom cruise's screwed up midline....that is all -> The real problem here is his tie and lack of collared shirt though *Typically the midline has to be off 4-5mm for it to be noticeable*</p>
Crossbite	<p>Anterior Crossbite can be single tooth or multiple teeth</p>  <p>Posterior Crossbite can be unilateral or bilateral -> Assess the midline. If it is off, then the crossbite could be due to functional shifting of the mandible.</p>  <p>-> Midlines are coincident, but there is a unilateral crossbite, Probably not a functional issue -> Both a midline discrepancy and a crossbite...Probably a functional shift issue</p>
Deep bite	 <p>-> Mandibular incisors can cause trauma to lingual gingiva of Max. and Max can cause trauma on mandibular buccal mucosa</p>
Open Bite	 <p>-> Unless we fix this problem, this person will never know what the middle of their sandwich tastes like. -Some say that this causes a lisp...It doesn't really though</p>

Overjet		
Crowding	Pretty self explanatory...Not really going to waste space here putting a picture of snarly British teeth	
Exposure of anterior Teeth and gingiva	<p>High Smile lines</p>  <p>Before Surgery & Braces After Surgery & Braces</p>	<p>-> In this case they had to break the maxilla and shift it up and then do braces to make sure the dentition came into occlusion nicely</p>

Congenitally Missing Teeth

Some Definitions:

Hypodontia = Absence of a few teeth

Oligodontia = Congenital Absence of many (but not all) teeth

Anodontia = Total absence of teeth

Saucy Statistics	<p>1.5-9.6% incidence in the general population</p> <ul style="list-style-type: none"> - Racial Tendency: African-American ($7.7\% \uparrow$ for missing Lower 2nd premolars); Japanese ($9.2\% \uparrow$ missing lower lateral incisors) - Gender Tendency: Woman > Men <p>If there is no Primary predecessor there will be no permanent tooth</p> <ul style="list-style-type: none"> - If all primary teeth are there, some permanent might still be missing
Oligodontia and Anodontia	<p>Associated with systemic issues</p> <ul style="list-style-type: none"> - Pretty rare <p>Ex: Ectodermal Dysplasia</p> <ul style="list-style-type: none"> - Thin, sparse hair - Absence of sweat glands - Congenitally missing teeth
Hypodontia	<p>Familial Hx:</p> <ul style="list-style-type: none"> - If there is family Hx of smaller tooth size = \uparrow risk the offspring will have hypodontia of that tooth <p>Associated with Craniofacial defects</p> <ul style="list-style-type: none"> - In Cleft population: Max lateral (on cleft side) $>>$ Max 2nd premolar $>>$ Mand 2nd premolar - General Population: Mand. 2nd premolar / Max lateral $>>$ Max 2nd premolar <p>Highest genetic component of variability = Max. Lateral Incisor</p> <ul style="list-style-type: none"> - Smallest genetic component of variability = Canines (Max and Mand) <p>Most common missing tooth (congenitally) = 3rd Molars (20%)</p> <ul style="list-style-type: none"> - 2nd Most common missing tooth = Lower 2nd premolar OR Upper lateral Incisor <p>Some other fun facts:</p> <ul style="list-style-type: none"> - Upper laterals are most frequently missing when 1-2 teeth are also missing - 2nd Premolars are most frequently missing when > 2 teeth are also missing - If 1-3 teeth are missing...the absent tooth will be the most distal of any given tooth type (Lateral, 2nd premolar, 3rd molar)

Treatment Options

		<u>Guidelines to consider</u>
Age of the patient	Vertical alveolar growth remaining Length of time in retention	
Facial profile	Extraction protocol	
Esthetics	Porcelain or composite veneers Implants Maryland or fixed bridges	
Periodontal concerns	Gingival architecture Bony levels	
Patient involvement	Patient activity and ability to maintain restoration long term Patients esthetic opinion Finances	

	Leave the Space Open	Close the space
Concept	<ul style="list-style-type: none"> - Create the correct amount of space - Leave the alveolar ridge ideal for future implants - Must manage the space! <p>Objectives</p> <ul style="list-style-type: none"> - Distalize the cuspids into Class I occlusion with a cuspid rise in lateral excursion - Maintain golden proportions (no strange tooth in a wrong place) - Improve Facial profile 	<ul style="list-style-type: none"> - Avoid detrimental alterations to occlusion and facial profile <p>Considerations:</p> <ul style="list-style-type: none"> - Esthetics (Gold proportions) related to tooth size discrepancies - Gingival architecture w/ mesial movement of cuspids to replace laterals - Need RCT and crown to eliminate lingual cusp interference of upper 1st premolar
Tx Options	<p>Single Tooth Implant (anterior areas)</p> <ul style="list-style-type: none"> - Concerned with maintaining ridge height while the patient is still growing <p>Posterior Space -> Retained primary molar (no 2nd premolar)</p> <ul style="list-style-type: none"> - ↓ width of the retained primary molar to optimize occlusion (Disk M and D) - If there is a disparity in alveolar bone levels (too low and out of occlusion) -> Extraction <ul style="list-style-type: none"> - If the <u>infraocclusion is minor</u>: Restorative build-up into occlusion, Disk the M and D, Leave space in upper arch to match occlusion. <p>Space Maintenance Indicated if:</p> <ul style="list-style-type: none"> - Minimal jaw growth remaining - Space you are holding is adequate for a restorative option - Occlusion is ideal - No further ortho is needed <p>-If you extracted:</p> <ul style="list-style-type: none"> - No space maintenance, allow for "orthodontic implant-site development" - Allow for passive eruption and drifting of adjacent teeth = maintains alveolus height - Then do ortho to recreate the implant space = robust alveolar ridge with little resorption 	<p>Missing Laterals</p> <ul style="list-style-type: none"> - Mesial movement of cuspids to replace the lateral incisors -> Recontour then to look like laterals
Lower Incisors missing?	<ul style="list-style-type: none"> - Maintains facial profile - Midlines are centered - Cuspid rise in function - BUT you need a prosthetic replacement <p>This seems like the better choice?</p>	<ul style="list-style-type: none"> - Creates flatter facial profile - Midline discrepancy - Lateral/Cuspid function consideration - How is the overjet?

Space Closure vs Space Maintenance

- No difference found in regard to occlusal function between group and cuspid rise
- No difference in periodontal risk
- Closure eliminates the need for a prosthesis in a young patient

Consequences of Delayed Ortho Tx

General issues if you don't seek dental Tx (kinda obvious)

Current You Problem	Future You Problem if current you doesn't get their shit together
Caries	-> Endo Tx
Dens Evaginatus	-> Endo Tx
Dentigerous Cyst	-> Bone loss, Resorption of adjacent teeth
High Frenum	-> Gingival recession
Avulsed Tooth	-> Replacement Resorption
Alveolar Clefting	-> Unstable alveolar arch for prosth. resto

Issues arising from Malocclusion

Current You Problem	Future You Problem if current you doesn't get their shit together
Digital Habit (Thumb sucking) Max. constriction w/ functional mandibular shift	-> Facial Esthetics (Anterior Open Bite and Protrusive anterior teeth with posterior crossbite)
Crowding/Arch length discrepancies	-> Root Resorption
Traumatic Anterior crossbite w/ A-P Shift	-> Periodontal Disease

Consequences of Timing

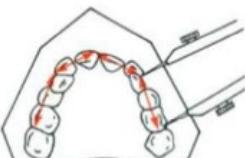
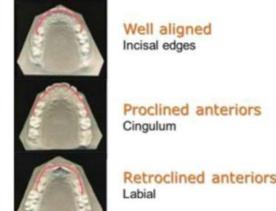
Too Early Tx	Too Late Tx
<ul style="list-style-type: none"> - Lateral incisor Root resorption w/ early FEA (Fixed Edgewise Appliance, AKA Braces) Tx - Long term period of retention - Poor patient cooperation 	<p>*You won't know it until it's too late, and they are adults*</p> <p><i>Could lead to:</i></p> <ul style="list-style-type: none"> - Random Drifting of teeth - Worsening the malocclusion due to growth

Consequence of Random Drifting
<p>1. Passive Eruption w/o opposing contact</p> <ul style="list-style-type: none"> - Overeruption of mand. Anteriors in Class III - Overeruption of Max. Anteriors = Impinging overbite - Premature loss of teeth and overeruption of unopposed
<p>2. Ectopic Eruption</p> <ul style="list-style-type: none"> - Impaction - Ankylosis - Resorption of upper primary 2nd molars <ul style="list-style-type: none"> - Causes space regaining
<p>3. Supernumerary teeth (Mesiodens) affecting eruption pattern of adjacents</p> <ul style="list-style-type: none"> - Earlier to extract Mesiodens and close the space the better
<p>4. Congenitally Missing teeth/Retained primaries</p> <ul style="list-style-type: none"> - Space maintenance vs Extraction - Prosthetic Prep - Associated w/ clefting
<p>5. Occlusal Wear</p> <ul style="list-style-type: none"> - Gingival architecture -> Overeruption of teeth w/ incisal wear - TMJ Symptoms

Consequences of Adverse Growth	
1. Growth Patterns	<p>Transverse Growth</p> <ul style="list-style-type: none"> - Easiest to Tx - Tx early or the patient will have major issues later - Tx: Retainer and Headgear, Expansion Devices <p>Anteroposterior growth</p> <ul style="list-style-type: none"> a. Class II – Max. Prognathism <ul style="list-style-type: none"> - <u>Kids</u>: Headgear to slow Max. growth so Mand. can catch up - <u>Adults</u>: Break Max, move it back and re-attach (obviously worse) Class II – Mand. Retrognathia (A majority of cases) <ul style="list-style-type: none"> - Functional Appliance b. Class III – Anterior Crossbite <ul style="list-style-type: none"> - Sometimes you can't do anything. - <u>Adult</u>: Surgery is the only option - Short Max...Functional appliance. ↑ face height to rotate mandible (clockwise) and ↑ vertical (Need unreal compliance though, lofty goals) <p>Vertical Growth</p> <ul style="list-style-type: none"> - Hardest to Tx - Usually wait until growth is done and then do a LaForte surgery
2. Functional concerns and influence on growth	<p>Maxillary constriction and a resulting Mandibular asymmetry w/ CR-CO discrepancy</p> <ul style="list-style-type: none"> - Consequence of delayed expansion that should have been dealt with earlier <p><u>Consequences of Delayed expansion</u></p> <ul style="list-style-type: none"> - Unstable/Difficult expansion later on - Adverse growth pattern - Mandibular skeletal asymmetry
3. Eruption pattern and crowding	<ul style="list-style-type: none"> - Decide on Expansion vs Extraction - Potential to effect facial esthetics, root resorption and perio issues - Prosthetic preparation

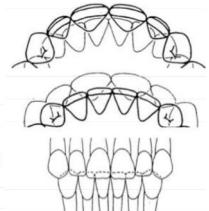
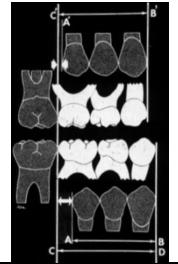
Mixed Dentition and Bolton Analysis

Typically measure a number of different parameters:

Width and Symmetry	<ul style="list-style-type: none"> - Arch Width (Canine- Canine, Premolar-Premolar, Molar-Molar etc) - Arch Depth <p>*Compare these values to established averages to determine if the Pt has a wider than normal, Narrower, Shallower, Deeper than normal arch*</p> <ul style="list-style-type: none"> - If it is deeper than normal we might have some vertical problems
Arch Length Required (Tooth Material)	<p>Measure the width of each tooth from Mesial of 6 to Mesial of 6.</p> <ul style="list-style-type: none"> - Add all of them together = Arch length req. 
Arch Length Available	<p><u>Segment Technique</u> (easier of the 2):</p> <ul style="list-style-type: none"> - Divide the arch into 4 straight line segments (each measured individually). Add them all up = Arch length available. <ul style="list-style-type: none"> - 6M – 3M = 1 length (3, 4, 5) - 1M-2D = 1 length (1, 2) - Repeat on other side <p><u>Brass Wire Technique</u>:</p> <ul style="list-style-type: none"> - Use malleable 0.5mm gauge wire - Contour over the alveolar crest or the buccal aspect of teeth from M6-M6 - If teeth are proclined, arrange wire where you want them (lingual to those teeth)  

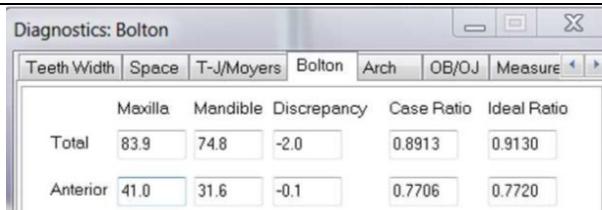
Calculations:

Arch Discrepancy for Permanent Dentition:	<p>[Arch length Available] – [Total Length Required] = Crowding or Spacing</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;"> </th><th style="text-align: center; padding: 5px;">ARCH CIRCUMFERENCE AVAILABLE (Mesial of first molar to mesial of first molar)</th><th style="text-align: center; padding: 5px;">ARCH CIRCUMFERENCE REQUIRED (Total Tooth Widths)</th><th style="text-align: center; padding: 5px;">ARCH SPACE DEFICIENCY (-) or ARCH SPACE EXCESS (+)</th></tr> </thead> <tbody> <tr> <td style="text-align: center; padding: 5px;">Maxillary</td><td style="text-align: center; padding: 5px;">80.0 mm</td><td style="text-align: center; padding: 5px;">74.4 mm</td><td style="text-align: center; padding: 5px;">+ 5.6 mm</td></tr> <tr> <td style="text-align: center; padding: 5px;">Mandibular</td><td style="text-align: center; padding: 5px;">62.4 mm</td><td style="text-align: center; padding: 5px;">65.6 mm</td><td style="text-align: center; padding: 5px;">- 3.2 mm</td></tr> </tbody> </table>		ARCH CIRCUMFERENCE AVAILABLE (Mesial of first molar to mesial of first molar)	ARCH CIRCUMFERENCE REQUIRED (Total Tooth Widths)	ARCH SPACE DEFICIENCY (-) or ARCH SPACE EXCESS (+)	Maxillary	80.0 mm	74.4 mm	+ 5.6 mm	Mandibular	62.4 mm	65.6 mm	- 3.2 mm																																																																																																																																							
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Early Mixed Dentition:	<p>They don't have Canines or Premolars yet....so you can't measure M6-M6 accurately really</p> <ul style="list-style-type: none"> - Measure the incisors only (these are the only permanent teeth we care about) - Use Moyer's Analysis OR Tanaka Johnston Method for estimating 3+4+5 size 																																																																																																																																																			
Moyer's	<ul style="list-style-type: none"> - This dude made a large chart measuring the average sum of the Upper 3, 4, 5 on 1 side based on the sum of the lower incisors (charted as percentiles of the population) - We go with the 75% values, its good enough 																																																																																																																																																			
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Bolton Tooth size Relationship Analysis	<p>No Tables 😊 However it produces the greatest amount of error and tends to over estimate the size of 3, 4, 5.</p> <ul style="list-style-type: none"> - Nice to use clinically during an exam and a rough starting point <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Diagnostics: Tanaka-Johnston / Moyers Analysis</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding: 2px;">Teeth Width</th> <th style="text-align: left; padding: 2px;">Space</th> <th style="text-align: left; padding: 2px;">TJ/Moyers</th> <th style="text-align: left; padding: 2px;">Bolton</th> <th style="text-align: left; padding: 2px;">Arch</th> <th style="text-align: left; padding: 2px;">OB/DU</th> <th style="text-align: left; padding: 2px;">M</th> </tr> </thead> <tbody> <tr> <td style="text-align: left; padding: 2px;">Available</td> <td style="text-align: left; padding: 2px;">SI</td> <td style="text-align: left; padding: 2px;">Moyers</td> <td style="text-align: left; padding: 2px;">Predict.</td> <td style="text-align: left; padding: 2px;">Req.</td> <td style="text-align: left; padding: 2px;">Tanaka-Johnston</td> <td style="text-align: left; padding: 2px;">Predict.</td> </tr> <tr> <td style="text-align: left; padding: 2px;">Maxilla: 73.9</td> <td style="text-align: left; padding: 2px;">31.0</td> <td style="text-align: left; padding: 2px;">44.0</td> <td style="text-align: left; padding: 2px;">75.0</td> <td style="text-align: left; padding: 2px;">44.0</td> <td style="text-align: left; padding: 2px;">75.0</td> <td style="text-align: left; padding: 2px;">75.0</td> </tr> <tr> <td style="text-align: left; padding: 2px;">Mandible: 64.5</td> <td style="text-align: left; padding: 2px;">22.0</td> <td style="text-align: left; padding: 2px;">43.2</td> <td style="text-align: left; padding: 2px;">65.2</td> <td style="text-align: left; padding: 2px;">43.0</td> <td style="text-align: left; padding: 2px;">65.0</td> <td style="text-align: left; padding: 2px;">65.0</td> </tr> </tbody> </table> <p style="margin-left: 20px;">Both sides added together for predicted widths of 3+4+5</p> </div> <p>**Issues: Leeway space is included in the available space number using OrthoCAD, this isn't ideal because it may be lost when deciduous teeth are lost (and teeth drift), and it would be nice to know how large this space is if you need to keep it open to align teeth**</p> <p>Leeway Space</p> <p>Permanent Premolars are smaller than Primary Molars</p> <ul style="list-style-type: none"> - Mandible: 1.7mm per side (2.5-3.5mm total) - Maxilla: 0.9mm per side (1.5-2.5mm total) <p>*If there is a flush terminal plane (6's are end-to-end) then we can use the leeway space to achieve a Class I occlusion</p> <p>- If Leeway is already lost w/ forward drifting of 6's = Subtract it from the "Available Space"</p>	Teeth Width	Space	TJ/Moyers	Bolton	Arch	OB/DU	M	Available	SI	Moyers	Predict.	Req.	Tanaka-Johnston	Predict.	Maxilla: 73.9	31.0	44.0	75.0	44.0	75.0	75.0	Mandible: 64.5	22.0	43.2	65.2	43.0	65.0	65.0																																																																																																																							
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$$\frac{\text{Sum}}{\text{Mandibular 6 Ant.}} \times 100 = 77.2\%$$

$$\frac{\text{Sum}}{\text{Maxillary 6 Ant.}}$$



If the **Ratio is > than the mean = Mandibular teeth are Excessive (Reduced Overjet)

- Consider interproximal reduction or extraction of mandibular incisors

If the **Ratio is < than the mean = Max. teeth are Excessive (Increased Overjet)

- Consider interproximal reduction of Max. incisors (or leave the ↑ OJ)

If the **discrepancy is < 1.5mm = we don't care clinically

Anterior Ratio > 77.2%		Anterior Ratio < 77.2%																																																																																																																																																	
<p>2. Anterior Ratio $\frac{\text{Sum mandibular } '6' \text{ mm}}{\text{Sum maxillary } '6' \text{ mm}} = \frac{38.5}{47.0} = 0.819$ x 100 = 81.9 %</p> <table border="1"> <thead> <tr> <th>Max '6'</th> <th>Mand '6'</th> <th>Max '6'</th> <th>Mand '6'</th> <th>Max '6'</th> <th>Mand '6'</th> </tr> </thead> <tbody> <tr><td>40.0</td><td>30.9</td><td>45.5</td><td>35.1</td><td>45.5</td><td>35.1</td></tr> <tr><td>40.5</td><td>31.3</td><td>46.0</td><td>35.5</td><td>45.5</td><td>35.9</td></tr> <tr><td>41.0</td><td>31.7</td><td>46.5</td><td>35.9</td><td>45.9</td><td>36.4</td></tr> <tr><td>41.5</td><td>32.0</td><td>47.0</td><td>36.3</td><td>46.3</td><td>36.8</td></tr> <tr><td>42.0</td><td>32.4</td><td>47.5</td><td>36.7</td><td>46.7</td><td>37.2</td></tr> <tr><td>42.5</td><td>32.8</td><td>48.0</td><td>37.1</td><td>48.5</td><td>37.4</td></tr> <tr><td>43.0</td><td>33.2</td><td>48.5</td><td>37.4</td><td>48.5</td><td>37.7</td></tr> <tr><td>43.5</td><td>33.6</td><td>49.0</td><td>37.8</td><td>49.0</td><td>38.0</td></tr> <tr><td>44.0</td><td>34.0</td><td>49.5</td><td>38.2</td><td>49.5</td><td>38.2</td></tr> <tr><td>44.5</td><td>34.4</td><td>50.0</td><td>38.6</td><td>50.0</td><td>38.6</td></tr> <tr><td>45.0</td><td>34.7</td><td></td><td></td><td>50.0</td><td>38.7</td></tr> </tbody> </table> <p>If anterior ratio exceeds 77.2: $\frac{38.5}{47.0} - \frac{36.3}{47.0} = 2.2 \text{ mm}$ Excess mand '6'</p>		Max '6'	Mand '6'	Max '6'	Mand '6'	Max '6'	Mand '6'	40.0	30.9	45.5	35.1	45.5	35.1	40.5	31.3	46.0	35.5	45.5	35.9	41.0	31.7	46.5	35.9	45.9	36.4	41.5	32.0	47.0	36.3	46.3	36.8	42.0	32.4	47.5	36.7	46.7	37.2	42.5	32.8	48.0	37.1	48.5	37.4	43.0	33.2	48.5	37.4	48.5	37.7	43.5	33.6	49.0	37.8	49.0	38.0	44.0	34.0	49.5	38.2	49.5	38.2	44.5	34.4	50.0	38.6	50.0	38.6	45.0	34.7			50.0	38.7	<p>2. Anterior Ratio $\frac{\text{Sum mandibular } '6' \text{ mm}}{\text{Sum maxillary } '6' \text{ mm}} = \frac{35.5}{47.0} = 0.755$ x 100 = 75.5 %</p> <table border="1"> <thead> <tr> <th>Max '6'</th> <th>Mand '6'</th> <th>Max '6'</th> <th>Mand '6'</th> <th>Max '6'</th> <th>Mand '6'</th> </tr> </thead> <tbody> <tr><td>40.0</td><td>30.9</td><td>45.5</td><td>35.1</td><td>50.5</td><td>39.0</td></tr> <tr><td>40.5</td><td>31.3</td><td>46.0</td><td>35.5</td><td>51.5</td><td>39.4</td></tr> <tr><td>41.0</td><td>31.7</td><td>46.5</td><td>35.9</td><td>51.5</td><td>39.8</td></tr> <tr><td>41.5</td><td>32.0</td><td>47.0</td><td>36.3</td><td>52.0</td><td>40.1</td></tr> <tr><td>42.0</td><td>32.4</td><td>47.5</td><td>36.7</td><td>52.5</td><td>40.5</td></tr> <tr><td>42.5</td><td>32.8</td><td>48.0</td><td>37.1</td><td>53.5</td><td>40.9</td></tr> <tr><td>43.0</td><td>33.2</td><td>48.5</td><td>37.4</td><td>53.5</td><td>41.3</td></tr> <tr><td>43.5</td><td>33.6</td><td>49.0</td><td>37.8</td><td>54.0</td><td>41.7</td></tr> <tr><td>44.0</td><td>34.0</td><td>49.5</td><td>38.2</td><td>54.5</td><td>42.1</td></tr> <tr><td>44.5</td><td>34.4</td><td>50.0</td><td>38.6</td><td>55.0</td><td>42.5</td></tr> <tr><td>45.0</td><td>34.7</td><td></td><td></td><td>55.0</td><td>42.7</td></tr> </tbody> </table> <p>If anterior ratio exceeds 77.2: $\frac{38.5}{47.0} - \frac{36.3}{47.0} = 2.2 \text{ mm}$ Excess mand '6'</p> <p>If anterior ratio is less than 77.2: $\frac{47.0}{46.0} - \frac{46.0}{46.0} = 1.0 \text{ mm}$ Excess max '6'</p> <p>For the size of max ants of 47.0mm</p>		Max '6'	Mand '6'	Max '6'	Mand '6'	Max '6'	Mand '6'	40.0	30.9	45.5	35.1	50.5	39.0	40.5	31.3	46.0	35.5	51.5	39.4	41.0	31.7	46.5	35.9	51.5	39.8	41.5	32.0	47.0	36.3	52.0	40.1	42.0	32.4	47.5	36.7	52.5	40.5	42.5	32.8	48.0	37.1	53.5	40.9	43.0	33.2	48.5	37.4	53.5	41.3	43.5	33.6	49.0	37.8	54.0	41.7	44.0	34.0	49.5	38.2	54.5	42.1	44.5	34.4	50.0	38.6	55.0	42.5	45.0	34.7			55.0	42.7
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43.5	33.6	49.0	37.8	49.0	38.0																																																																																																																																														
44.0	34.0	49.5	38.2	49.5	38.2																																																																																																																																														
44.5	34.4	50.0	38.6	50.0	38.6																																																																																																																																														
45.0	34.7			50.0	38.7																																																																																																																																														
Max '6'	Mand '6'	Max '6'	Mand '6'	Max '6'	Mand '6'																																																																																																																																														
40.0	30.9	45.5	35.1	50.5	39.0																																																																																																																																														
40.5	31.3	46.0	35.5	51.5	39.4																																																																																																																																														
41.0	31.7	46.5	35.9	51.5	39.8																																																																																																																																														
41.5	32.0	47.0	36.3	52.0	40.1																																																																																																																																														
42.0	32.4	47.5	36.7	52.5	40.5																																																																																																																																														
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44.0	34.0	49.5	38.2	54.5	42.1																																																																																																																																														
44.5	34.4	50.0	38.6	55.0	42.5																																																																																																																																														
45.0	34.7			55.0	42.7																																																																																																																																														
<p>If >> then the Mandible is likely off (top of the ratio). Use Max number to find the corrected Mandible # and calculate the difference</p>																																																																																																																																																			
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Total Ratio < 91.3%																																																																																																																																																			
<p>1. Overall Ratio $\frac{\text{Sum mandibular } '12' \text{ mm}}{\text{Sum maxillary } '12' \text{ mm}} = \frac{85.8}{97.0} = 0.885$ x 100 = 88.5 %</p> <table border="1"> <thead> <tr> <th>Max '12'</th> <th>Mand '12'</th> <th>Max '12'</th> <th>Mand '12'</th> <th>Max '12'</th> <th>Mand '12'</th> </tr> </thead> <tbody> <tr><td>86</td><td>77.4</td><td>95</td><td>85.4</td><td>103</td><td>94.0</td></tr> <tr><td>86</td><td>79.4</td><td>96</td><td>86.7</td><td>104</td><td>95.0</td></tr> <tr><td>87</td><td>79.4</td><td>96</td><td>87.6</td><td>105</td><td>95.9</td></tr> <tr><td>88</td><td>80.3</td><td>97</td><td>88.6</td><td>106</td><td>96.8</td></tr> <tr><td>89</td><td>81.3</td><td>98</td><td>89.5</td><td>107</td><td>97.8</td></tr> <tr><td>90</td><td>82.3</td><td>99</td><td>90.4</td><td>108</td><td>98.5</td></tr> <tr><td>91</td><td>83.1</td><td>100</td><td>91.3</td><td>109</td><td>99.5</td></tr> <tr><td>92</td><td>84.0</td><td>101</td><td>92.2</td><td>110</td><td>100.4</td></tr> </tbody> </table> <p>If the overall ratio exceeds 91.3: $\frac{85.8}{97.0} - \frac{94.0}{97.0} = 3 \text{ mm}$ Excess mand '12'</p> <p>If the overall ratio is less than 91.3: $\frac{97.0}{94.0} - \frac{94.0}{94.0} = 3 \text{ mm}$ Excess max '12'</p> <p>For the size of mand 12 of 85.8 mm</p>				Max '12'	Mand '12'	Max '12'	Mand '12'	Max '12'	Mand '12'	86	77.4	95	85.4	103	94.0	86	79.4	96	86.7	104	95.0	87	79.4	96	87.6	105	95.9	88	80.3	97	88.6	106	96.8	89	81.3	98	89.5	107	97.8	90	82.3	99	90.4	108	98.5	91	83.1	100	91.3	109	99.5	92	84.0	101	92.2	110	100.4																																																																																										
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87	79.4	96	87.6	105	95.9																																																																																																																																														
88	80.3	97	88.6	106	96.8																																																																																																																																														
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American Board of Orthodontists Discrepancy Index

= A scoring system developed to give General Dentists an idea of the complexity, difficulty and timeline for orthodontic issues

- Forces a complete assessment to be done
- Aids dentists in knowing when to refer to Ortho
- Prevents dentists from needing to take unnecessary Pan and Ceph radiographs

If total score is >5 = Refer

ABO DISCREPANCY INDEX INSTRUCTIONS

Updated 8/3/2015

Occlusion for plaster models is determined by placing the separated, properly trimmed study casts (Mx/Mn) on a flat surface and then bringing them together into maximum intercuspal position. All measurements must be made from this position. For digital models, measurements will be made from a standard 3D orientation that is described in [ABO Digital Model Requirements](#).

OVERJET: Overjet is a measurement between two antagonistic anterior teeth (lateral or central incisors) comprising the greatest overjet and is measured from the facial surface of the most lingual mandibular tooth to the middle of the incisal edge of the more facially positioned maxillary tooth.

- For ≥ 0 to <1 mm, score 1 pt (edge-to-edge)
- For ≥ 1 to ≤ 3 mm, score 0 pts
- For >3 to ≤ 5 mm, score 2 pts
- For >5 to ≤ 7 mm, score 3 pts
- For >7 to ≤ 9 mm, score 4 pts
- For >9 mm, score 5 pts.
- In addition, if there are anterior teeth with negative overjet (canine to canine in anterior crossbite >0 mm), measure from the facial surface of the maxillary tooth to the middle of the incisal edge of the mandibular tooth.
 - Round any fractional remainder to the next full mm,
 - Then score 1 pt per mm per anterior tooth in crossbite.

OVERBITE: Overbite is a measurement between two antagonistic anterior teeth (lateral or central incisors) comprising the greatest overbite.

- For >0 to ≤ 3 mm, score 0 pts
- For >3 to ≤ 5 mm, score 2 pts
- For >5 to ≤ 7 mm, score 3 pts
- If any of the lower incisors are impinging on the palatal tissues (≤ 0.5 mm) or there is 100% overbite (a complete vertical overlap of antagonistic incisors), score 5 pts.

ANTERIOR OPEN BITE: For each anterior tooth (canine to canine) in an open bite relationship with an opposing tooth, measure from the incisal edge of the Mx tooth to the incisal edge of the Mn tooth.

- For each anterior tooth in edge-to-edge relationship (0 mm), score 1 pt per tooth.
- For each anterior tooth in open bite (> 0 mm), round any fractional remainder to the next full mm,
- Then add 1 pt per mm per tooth in open bite.
- No points are scored for any anterior tooth that is blocked-out of the arch due to space deficiency or not fully erupted.

LATERAL OPEN BITE: For each maxillary posterior tooth (from the 1st premolar to 2nd molar) in an open bite relationship ≥ 0.5 mm from its opposing tooth, measure cusp to cusp.

- Round any fractional remainder to next full mm
- Then score 2 pts per mm of open bite for each tooth.
- No points are scored for any tooth that is blocked-out of the arch due to space deficiency or not fully erupted.

CROWDING: Measure the most crowded arch (only one arch) from the mesial contact point of the right first molar to the mesial contact point of the left first molar. If there are conditions such as missing, fractured or decayed teeth, then measure crowding consistent with your treatment objectives and be prepared to defend the score at your oral examination.

- For ≥ 0 to ≤ 1 mm, score 0 pts
- For >1 to ≤ 3 mm, score 1 pt
- For >3 to ≤ 5 mm, score 2 pts
- For >5 to ≤ 7 mm, score 4 pts
- For >7 mm, score 7 pts.

OCCLUSAL RELATIONSHIP: Models must exhibit the patient's maximum intercuspaton. The Angle molar classification is used.

- If the mesiobuccal cusp of the maxillary first molar occludes with the buccal groove of the mandibular first molar or anywhere between the buccal groove and the mesiobuccal or distobuccal cusps (Class I to End On) - Score 0 pts.
- If the mesiobuccal cusp of the maxillary first molar occludes with the mesiobuccal (Class II end-to-end) or distobuccal (Class III end-to-end) cusps of the mandibular first molar – Score 2 pts per side.
- If the relationship is a full Class II or III - Score 4 pts per side.
- If the relationship is beyond Class II or III, measure the additional distance, round any fractional remainder to next full mm – Score 4 pts plus 1 addl. pt per mm per side.

LINGUAL POSTERIOR CROSSBITE: For each maxillary posterior tooth (from the 1st premolar to the 2nd molar) where the maxillary buccal cusp is > 0 mm lingual to the buccal cusp tip of the opposing tooth - Score 1 pt per tooth.

BUCCAL POSTERIOR CROSSBITE: For each maxillary posterior tooth (from the 1st premolar to the 2nd molar) where the maxillary palatal cusp is > 0 mm buccal to the buccal cusp of the opposing tooth - Score 2 pts per tooth.

CEPHALOMETRICS: (See [Construction of Mandibular Plane](#))

- If the ANB angle is $\geq 6^\circ$ OR $\leq -2^\circ$, score 4 pts; then, add 1 pt for each full degree $> 6^\circ$ OR $< -2^\circ$.
- If the SN-MP angle is between 27° and 37° score 0 pts.
- If the SN-MP angle is $\geq 38^\circ$, score 2 pts; then, add 2 pts for each full degree $> 38^\circ$.
- If the SN-MP angle is $\leq 26^\circ$, score 1 pt; then, add 1 pt for each full degree $< 26^\circ$.
- If the Lower Incisor to MP angle is $\geq 99^\circ$, score 1 pt; then, add 1 pt for each full degree greater than 99° .

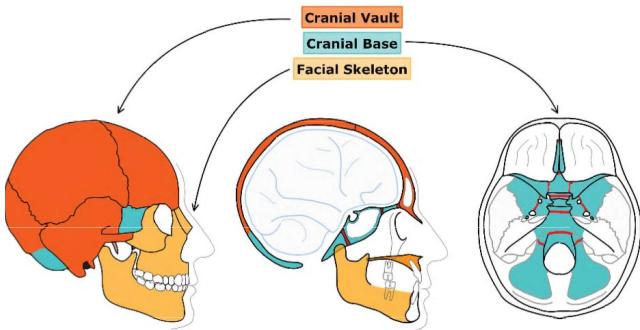
OTHER: (List number of occurrences and total points.)

- **Supernumerary teeth** – Score 1 pt for each extra tooth.
- **Ankylosis** of permanent teeth – Score 2 pts per tooth.
- **Anomalous morphology** of tooth size & shape (e.g. natural and/or iatrogenic) - Score 2 pts per tooth.
- **Impaction** of teeth (except 3rd molars) – Score 2 pts per tooth.
- **Midline discrepancy** – The midline for each arch equals the mid-point between the Mx central incisors and the Mn central incisors demonstrated by two vertical reference lines. The discrepancy is the difference between the two vertical reference lines measured in the horizontal plane – Score 2 pts for ≥ 3 mm.
- **Missing teeth** (except 3rd molars) -
 - Non-congenital – Score 1 pt per tooth.
 - Congenital – Score 2 pts per tooth.
- **Spacing** –
 - For generalized spacing per arch in which there is ≥ 0.5 mm of space on both sides of any 4 teeth or more - Score 2 pts per arch.
 - For Mx central diastema of ≥ 2 mm - Score 2 pts.
- **Tooth transposition** – Score 2 pts for each event.
- **Skeletal asymmetry** (treated nonsurgically) – Score 3 pts (appropriate diagnostic information recommended)
- **Additional treatment complexities** - Score 2 pts each and identify.

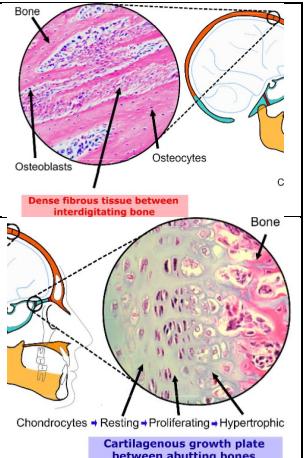
FOR ADDITIONAL VISUAL REFERENCE, SEE "[DISCREPANCY INDEX SCORING SYSTEM](#)"

Growth Indices

Growth and development of the head occurs in 3 areas:



Facial Skeleton	
Cranial Vault	<p>Bone formed via Intramembranous Ossification</p> <ul style="list-style-type: none"> - Bone is placed directly into the mesenchyme - Sutures are found between interdigitating bone -> Dense fibrous tissue - Osteoblasts and Osteoclasts directly involved with bone formation and remodeling
Cranial Base	<p>Bone formed via Endochondral Ossification</p> <ul style="list-style-type: none"> - Cartilage scaffold is laid down 1st and replaced w/ bone - Synchondroses exist between 2 growth plates -> Cartilaginous growth plate - Chondrocytes in hypertrophic zone lay down cartilage that will be replaced with bone



Growth occurs Allometrically

- This means the shape changes w/ growth.
- Vs. Isometric growth = everything grows out evenly, if this were us we would all look like large ugly babies --->



Different tissues and regions of the body grow at unique rates -> Changes in **Size** and **Shape**

- Limbs ↑ in size dramatically vs the head which grows minimally

Mandibular Growth	
Naso-Maxillary Complex	

Cranial Base	<p>Apposition at both sutures AND synchondroses</p> <ul style="list-style-type: none"> - Spheno-Occipital and Spheno-Ethmoidal are the main synchondroses where growth (apposition) occurs in the cranial base <p>Nasal Bones, Septal cartilage and Cranial base gets displaced forward and down</p> <ul style="list-style-type: none"> - Cranial base also contributes to the downward, forward movement of the maxilla
Remodelling	<p>-> Areas in blue are the resorptive areas</p>

Sequence of Dimensional growth

1. Transverse (width)
2. Anteroposterior
3. Vertical (Last to finish)
 - As vertical dimension ↑, the teeth erupt further to maintain occlusal contact = ↑ alveolar bone height

Anteroposterior Growth -----> Vertical Growth



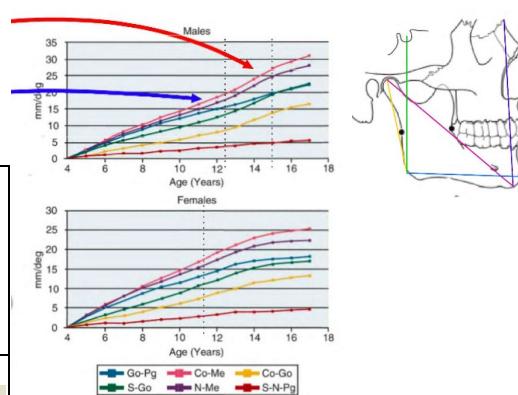
Growth rates are not constant with age!

Class II correction to promote mandibular growth is best **During** peak in growth

Class III Correction to advance the midface is best done **Before** peak in growth

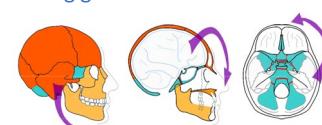
(Classic Exam Q's)

Class III	Tx: <ul style="list-style-type: none"> - Protrusive headgear to pull Max. forward - Before peak 	
Class II	Tx: <ul style="list-style-type: none"> - Cervical headgear to slow max. growth and pull mandible forward - Twin Block -> Forces mandible forward when Pt bites - During peak in growth 	



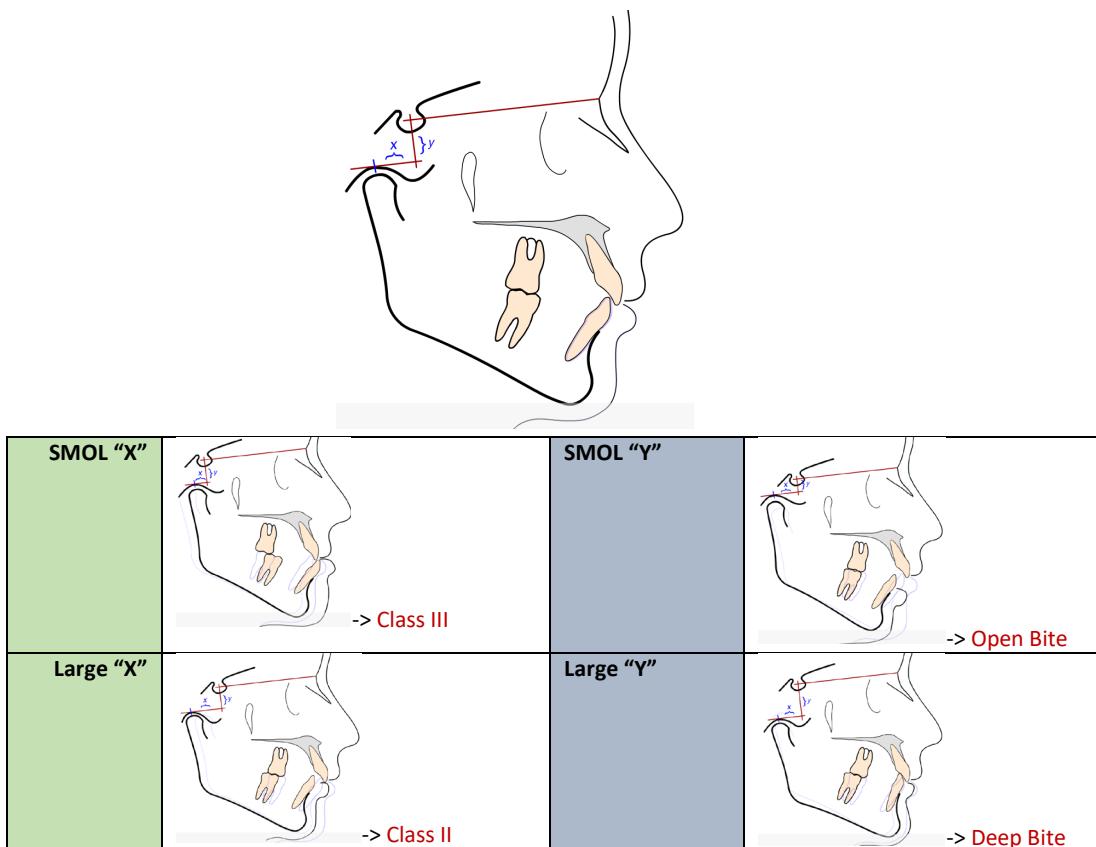
If you Tx too early, the skeletal discrepancy can reappear as growth continues

Some Random Terms			
Modularity	= Each module/region of the skull grows independently of each other	Integration	= Regions of the skull are influenced by others during growth



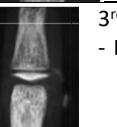
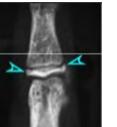
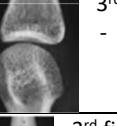
Integration Between Cranial Base and Midface

Measuring the distance from **Sella and Glenoid Fossa** we can predict the skeletal occlusal relationship:

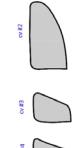
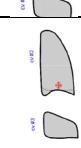
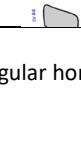
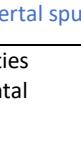
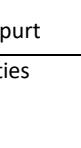


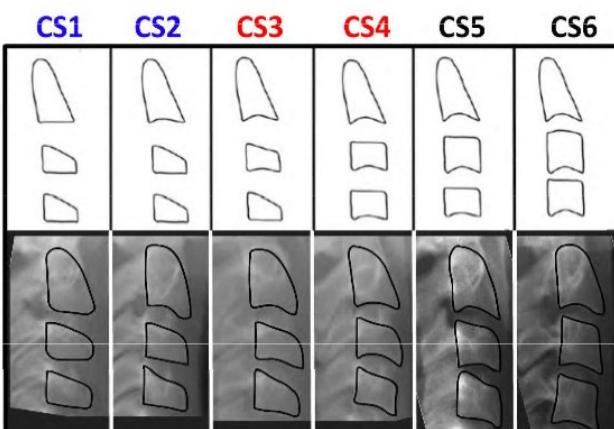
Methods for assessing growth

Chronological	# of years a person has lived <ul style="list-style-type: none"> - NOT a reliable method to identify the onset of pubertal growth - Boys up to age 9 = Pre-Pubertal - Girls after 14 years = Post Pubertal
Psychological	
Functional	
Social	
Biological	Hand and Wrist Maturation (HWM) Third Finger Middle Phalanx Maturation Cervical Vertebral Maturation Dental Maturation
Hand Wrist Maturation Method	<p>Evaluates specific ossification events</p> <p>First look for this...</p> <p>... if yes then this</p> <p>Flowchart of ossification events:</p> <pre> graph TD A[4. OSSIFICATION ADDUCTOR SESAMOID THUMB] -- NO? --> B[1. PROX. PHALANX THIRD FINGER] B -- WIDTH --> C[2. MIDDLE PHALANX THIRD FINGER] C -- WIDTH --> D[3. MIDDLE PHALANX FIFTH FINGER] D -- CAPPING --> E[5. DISTAL PHALANX THIRD FINGER] E -- CAPPING --> F[6. MIDDLE PHALANX THIRD FINGER] F -- CAPPING --> G[7. MIDDLE PHALANX FIFTH FINGER] G -- FUSION --> H[9. PROX. PHALANX THIRD FINGER] H -- FUSION --> I[10. MIDDLE PHALANX THIRD FINGER] I -- FUSION --> J[11. RADIUS] H -- YES? --> K[8. DISTAL PHALANX THIRD FINGER] K -- FUSION --> L[10. MIDDLE PHALANX THIRD FINGER] L -- FUSION --> M[11. RADIUS] </pre>

	SMI 1		3 rd finger proximal phalanx, - Epiphysis as wide as metaphysis	Pre-Pubertal (Before Growth Peak)
	SMI 2		3 rd finger middle phalanx - Epiphysis as wide as metaphysis	
	SMI 3		5 th finger middle phalanx - Epiphysis as wide as metaphysis	
	SMI 4		Thumb - Appearance of adductor sesamoid	
	SMI 5		3 rd finger distal phalanx - Epiphysis shows capping towards metaphysis	Coincides with Growth Peak
	SMI 6		3 rd finger middle phalanx - Epiphysis shows capping towards metaphysis	
	SMI 7		5 th finger middle phalanx - Epiphysis capping towards metaphysis	
	SMI 8		3 rd finger distal phalanx - Fusion of epiphysis and diaphysis	
	SMI 9		3 rd finger proximal phalanx - Fusion of epiphysis and diaphysis	Post-Pubertal (After Peak)
	SMI 10		3 rd finger middle phalanx - Fusion of epiphysis and diaphysis	
	SMI 11		Radius - Fusion of epiphysis and diaphysis	



Cervical Vertebral Maturation Method	CS1	<u>Lower Borders</u> C2, C3, C4 -> Flat <u>Bodies</u> C3, C4 -> Trapezoid		Class III Growth Modification Tx
	CS2	<u>Lower Border</u> C2 -> Concavity <u>Bodies</u> C3, C4 -> Trapezoid		
	CS3	<u>Lower Borders</u> C2, C3 -> Concavities <u>Bodies</u> C3, C4 -> Trapezoid or rectangular horizontal		Class II Growth Modification Tx
	CS4	<u>Lower borders</u> C2, C3, C4 -> Concavities <u>Bodies</u> C3, C4 -> Rectangular horizontal		
	CS5	<u>Lower Borders</u> C2, C3, C4 -> Concavities <u>Bodies</u> C3, C4 -> Squared		Phase II Tx for Class III Pt (Surgery etc)
	CS6	<u>Lower Borders</u> C2, C3, C4 -> Concavities <u>Bodies</u> C3, C4 -> Rectangular Vertical		

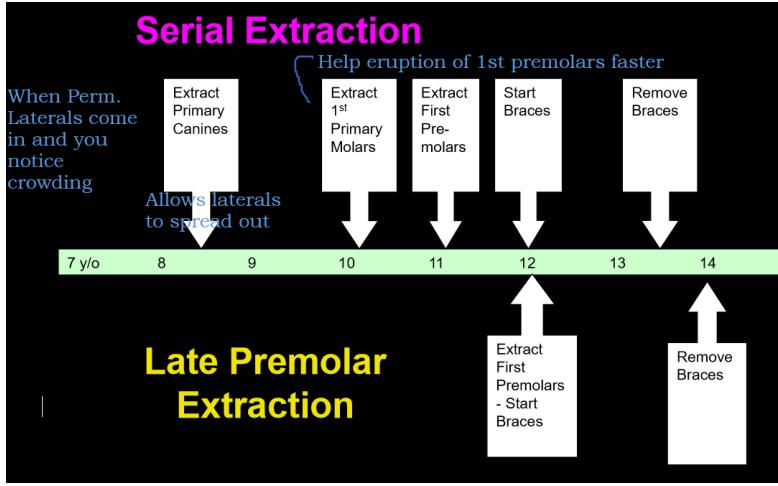


Dental Maturation	<ul style="list-style-type: none"> - Not super clinically useful - We don't need to know it for the exam
Superimposition of Serial Cephs	<ul style="list-style-type: none"> - This is a good way to see if growth has stopped - Take films: 6 months -1 year apart -> Superimpose on cranial base - Good indicator for Class III tx timing

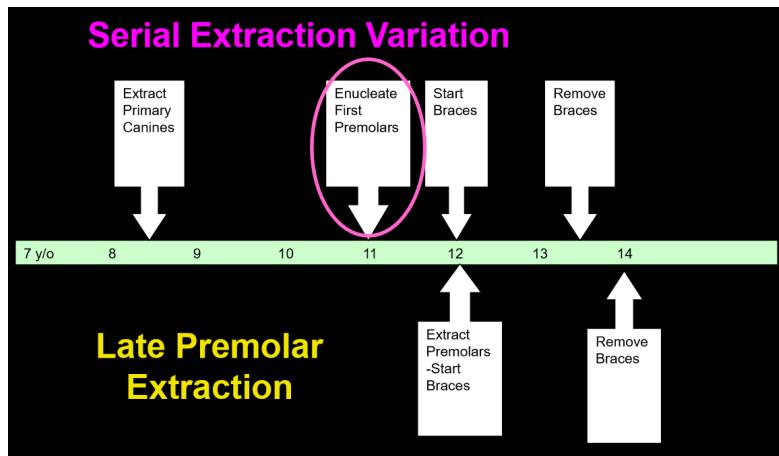
Growth changes occur all throughout life but become very slow after mid 20's

	Advantages	Disadvantages
Hand Wrist Maturation	Independent of population differences Independent of secular trends	Needs more X-Rays with ↑ exposure Prevents serial recording Limited to single stages

Serial Extractions

What is it?	= The planned sequential removal of primary, then permanent teeth...followed by fixed appliances (braces)
Indications (Classic Exam Q)	<ul style="list-style-type: none"> - Class I occlusion - No missing teeth - No ectopic teeth - Minimal overbite - Protrusive dentition - Significant crowding (>8mm)
Sequence	<ol style="list-style-type: none"> 1. Notice crowding when permanent Laterals come in <ul style="list-style-type: none"> - 7ish 2. Extract Primary Canines <ul style="list-style-type: none"> - 8-9ish - Allows your crowded laterals to spread out 3. Extract 1st primary molars <ul style="list-style-type: none"> - 10ish - Helps the 1st premolars erupt faster 4. Extract 1st Permanent premolars <ul style="list-style-type: none"> - 11ish 5. Start Braces <ul style="list-style-type: none"> - 12-14yrs old  <p>When Perm. Laterals come in and you notice crowding</p> <p>Extract Primary Canines</p> <p>Allows laterals to spread out</p> <p>Extract 1st Primary Molars</p> <p>Extract First Pre-molars</p> <p>Start Braces</p> <p>Remove Braces</p> <p>Help eruption of 1st premolars faster</p> <p>7 y/o 8 9 10 11 12 13 14</p> <p>Late Premolar Extraction</p>

Save about 6 months of time in braces with the serial extraction method -> Because you have alleviated a lot of the anterior crowding by 1st removing the primary canines, there is less movement needed by the braces

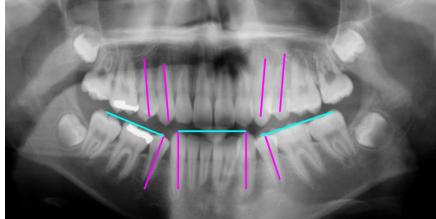


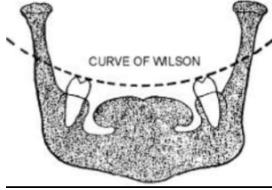
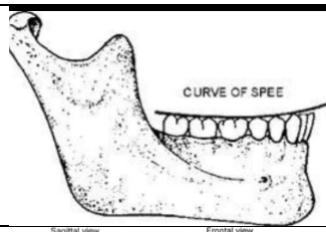
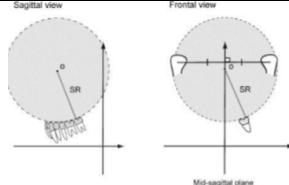
Can also enucleate the 1st permanent premolars and not wait till they erupt

Results of Serial Extractions (Exam Q)	Advantages	Disadvantages
	<ul style="list-style-type: none"> - Self Straightening and improved alignment -> Teeth will spread out and fill the space you have created - Canines erupt into attached gingiva -> No tiger teeth (Canines erupting buccally of the alveolar ridge) - Space Closure - Shorter active Tx time 	<ul style="list-style-type: none"> - Mesial tipping of mandibular 5's though - Deeper curve of Spee - Deeper curve of Wilson - Deepened Overbite <p>...will need braces to fix these</p>



Late Premolar Extraction results in Canines erupting buccally -> Results in "tall" teeth when done


Curve of Wilson	Measure the B-L inclination of 1 st molars by the angle formed by Max. buccal cusps and Mand. lingual cusps -> Occlusal Plane	
Curve of Spee (ideally $\approx 1.5^\circ$)	Greatest perpendicular depth from the plane formed by incisal edge -> DB cusp tips of most distal teeth	
Monson's Sphere	Spherical arrangement of dental cusps and incisal edges in natural human dentition <ul style="list-style-type: none"> - Occlusal surfaces of all teeth touch a segment of spherical surface 	

Dental Implications of Orofacial Clefting

= The **most common craniofacial** anomaly (1/1000 in Canada)

- May be *incomplete* cleft, *Complete*, *Unilateral* or *Bilateral* -> 70% are non-syndromic

Timeline for repairs:

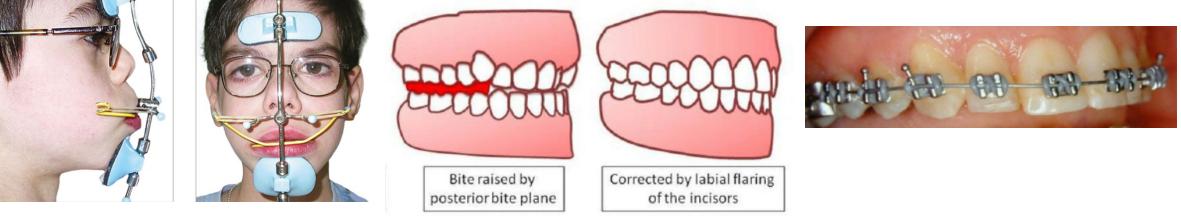
Repair	Age
Lip	3-5 months
Palate	9-12 months

Implications	
Caries + OHE	<ul style="list-style-type: none"> - ↑ caries incidence in teeth erupting ectopically in/around clefting site
Numerical Anomalies	<ul style="list-style-type: none"> - Supernumerary Teeth - Congenitally Missing teeth <ul style="list-style-type: none"> - Cleft Pop. = Cleft Side Lateral Incisor > Cleft side Max. 2nd Premolar > Mand 2nd premolar - General Pop. = Mand. 2nd premolar/Max Lateral Incisor > Max. 2nd Premolar
Management of Fistula/Speech	<p>Oronasal Fistula -> Considered a Surgical failure of the primary repair 😞</p> <ul style="list-style-type: none"> - Vestibular Fistula -> Tx at time of alveolar bone grafting <ul style="list-style-type: none"> - Asymptomatic - No nasal regurgitation - Usually don't really know it's there unless you look for it - Palatal Fistula -> Surgery OR placement of Obturator <ul style="list-style-type: none"> - Presents with Nasal regurgitation of food - Hypernasal speech -> Cannot say "D", "P", "B" -> "Donald Duck Pooped in Barbara's Bedroom" - Tx with palatal obturator and speech retainer -> Extends to soft palate and obstructs it just enough to allow air flow. Results in ↓ hypernasal speech
Alveolar Bone Grafting	<p>Timing: PRIOR to ½-2/3rd root development of the Cleft side Cuspid (Canine) -> Usually 8-10 yrs old Donor Site: Pt's iliac crest</p> <p>Indications:</p> <ul style="list-style-type: none"> - Eliminate oronasal fistula - Stabilize alveolar segments - Create cosmetic dental arch form - Support eruption of teeth near the cleft - Provide stable platform for both the Nasal Floor and dental implants <p>Factors affecting graft success:</p> <ul style="list-style-type: none"> - Size of original defect - Condition of recipient site - Source of the bone (donor site) - Surgeon's skill - State of patient's oral health
Facial Asymmetry and Malocclusion	<p>Tx Sequence:</p> <ol style="list-style-type: none"> 1. Presurgical orthodontic therapy: Nasoalveolar moulding of the cleft newborn prior to primary surgeries <ul style="list-style-type: none"> - Take impression, create removable appliance to fill the space and make the alveolar ridge segments grow more symmetrically for later surgery 2. Parental and Pt education to ensure excellent oral hygiene 3. Timing of alveolar grafting determined based on relationship of teeth adjacent to cleft site (1/2 - 2/3rd root development of canine) 4. Timing for extraction of non-functional or carious teeth in cleft site 5. Obturate symptomatic fistulae (providing surgical closure is not possible) 6. Growth assessment and addressing skeletal discrepancies 7. Max. expansion in preparation for alveolar bone grafting 8. Incisor alignment after successful alveolar bone grafting 9. Assessment for definitive ortho Tx w/ eruption of permanent dentition -> Orthognathic surgery as needed 10. Prosthetic reconstruction at the completion of ortho Tx and establishment of alveolar arch stability <p>**This is all quite expensive -> Financial assistance for prosthetic Tx can be provided through BCDA until age 25**</p>

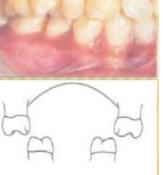
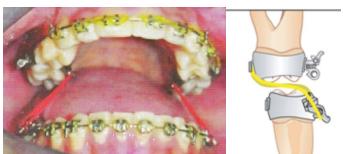
Crossbites

Definition	<p>= Abnormal relationship of a tooth/teeth to the opposing teeth where normal Buccolingual relationships are reversed</p> <ul style="list-style-type: none"> - Generally, not self-correctable <p>Prevalence:</p> <ul style="list-style-type: none"> - Deciduous + Mixed Dentition -> 8-16% (pretty common) <p>Etiology:</p> <ul style="list-style-type: none"> - Environmental (Habitual) -> Thumb Sucking habits <ul style="list-style-type: none"> - Classic Thumb Sucking signs: Anterior Open Bite + Posterior Cross Bite - Congenital -> Clefting <ul style="list-style-type: none"> - Always have Skeletal Transverse Deficiency (Max. arch is narrow compared to Mand.) - Developmental - Traumatic - Iatrogenic
Diagnosis	<ul style="list-style-type: none"> - Unilateral or Bilateral Posterior Crossbites - Crowded, rotated, palatally or buccally displaced teeth - Narrow tapering Max. arch form - Narrow high palatal vault
Hidden Crossbites (Discovered after Teeth are straightened)	<p><u>Dental Compensation Hiding Class III:</u></p> <ul style="list-style-type: none"> - Accentuated Lower Curve of Wilson + Flared Upper Incisors + Upright lower incisors - A / P Crossbites may only appear after dental compensation has been corrected <p><u>Class II:</u></p> <ul style="list-style-type: none"> - Skeletal A-P Relationship is corrected -> This results in wider part of mandible moving into a more narrow part of the maxilla. Has now created a Posterior crossbite
Why Fix them? EXAM Q	<ul style="list-style-type: none"> - Chipping and wearing of teeth - Perio Problems -> Recession - Esthetics

Classifications

Anterior Crossbites	
Dental	<p>Typically only 1 or 2 teeth</p> <ul style="list-style-type: none"> - If > 2, then it is more likely to be a skeletal problem (a full arch segment for ex) <p><u>Causes:</u></p> <ul style="list-style-type: none"> - Insufficient arch length - Over-retention of primary teeth -> Perm erupts Labially - Ectopic development of the tooth bud (idiopathic or trauma related)
Skeletal	<p><u>Associated with Skeletal Class III</u></p> <ul style="list-style-type: none"> - Entire anterior segment is in crossbite (Mandibular anteriors are in front of maxillary anteriors) - Dental Compensation may make this appear to be a dental crossbite -> When you line the teeth up then we see that it was actually a skeletal crossbite and surgery will be needed to finish up the Tx <p>**Deep nasolabial fold on the facial profile = indication that there is likely a skeletal crossbite**</p> <p><u>Tx:</u></p> <p><u>Growing Patient:</u></p> <ul style="list-style-type: none"> - Face-Mask (skeletal maxillary deficiency) - Posterior Bite-Plane to help the teeth "jump" the bite - Fixed Edgewise Appliance (FEA) -> Fancy talk for "Braces" <p>(Fancy Boi turning that frown upside down)</p>  <p>Bite raised by posterior bite plane</p> <p>Corrected by labial flaring of the incisors</p> <p><u>Non-Growing Patient:</u></p> <ul style="list-style-type: none"> - Surgery
Functional (Pseudo Class III)	<p>1 or 2 teeth are tipped in such a way that in order to make their molars contact the jaw must move forward (and also maybe laterally)</p> <ul style="list-style-type: none"> - Entire anterior segment is in reverse overjet in CO -> When you manipulate the jaw into CR though the incisors are edge-to-edge or in a normal positive overjet <p>Proper Dx of this is critical -> may have dental +/- Skeletal components:</p> <ul style="list-style-type: none"> - Dental -> Linguoversion of Max. anteriors or Labioversion of Mand. anteriors - Skeletal: Slight Max. retrognathism or slight mandibular prognathism <ul style="list-style-type: none"> - If it is primarily skeletal in nature then it will not be a Pseudo Class III

Posterior Crossbite

Dental <ul style="list-style-type: none"> - May be unilateral or bilateral, single tooth or groups of teeth - Teeth are tipped buccal/lingual - Can be a malposition of teeth in only 1 or both arches - May occur in cases of skeletal transverse discrepancies 	 Classic Example: Scissor/Buccal Crossbite <ul style="list-style-type: none"> - Max. molars are completely buccal to the mand. molars 
Tx: <ul style="list-style-type: none"> - Removable appliances with fingersprings -> Tips the teeth - Removable appliances with midline jackscrew -> Tips the teeth, adjustments made at home to expand more and more over time - Fixed Appliances -> Torque and derotate teeth (involved tooth movement within the alveolus) - Cross Arch Elastics - Occlusal Adjustment or Extraction of Primary Canines 	 -> Crossarch elastics
Skeletal <p><u>Bilateral</u></p> <ul style="list-style-type: none"> - Constricted/narrow Maxilla opposing a normal mandible <p><u>Unilateral</u></p> <ul style="list-style-type: none"> - Usually symmetrical maxillary constriction associated w/ functional shift - Less commonly -> aberration in growth (Cleft palate) - Asymmetric growth (no functional shift in this case) -> Could be idiopathic or result of condylar damage or disease 	Tx: <ul style="list-style-type: none"> - Rapid Maxillary Expander (RME) - Superscrew (Wrench) - W-Arch - Quad Helix - Removable Split Acrylic Plates -> For very young patients only <p>**Expansion doesn't work if the patient has stopped growing** -> Need surgery if they have fully grown</p> <div style="display: flex; justify-content: space-around; align-items: center;">  -> Quad Helix Expander  -> W-Arch Expander </div> <div style="display: flex; justify-content: space-around; align-items: center;">  -> Rapid Palatal Expander  -> Superscrew Expander </div> <div style="display: flex; justify-content: space-around; align-items: center;">  -> Split Plate Expander </div>

W-Arch + Quad Helix

Advantages	<ul style="list-style-type: none"> - Practitioner controls the expansion (Slow skeletal expansion) - Can Adjust the arms to make specific dental movement at the same time - Easier adjustment period for the patient (Vs RPE) -> smaller appliance
Disadvantages	<ul style="list-style-type: none"> - ↑ chair time (Have to come in for adjustments) - May require multiple removal and re-cementations to maintain activation - ↑ dental tipping compared to RPE (might not be what we want) - Arms can be distorted/broken by the patient

Rapid Palatal Expander	
Advantages	<ul style="list-style-type: none"> - Maximum skeletal change - Activation is done at home by patient/parent (\downarrow chair time) - Activation rate is customised based on rate of screw turns - Sturdy appliance -> Cannot be bent or broken by patient
Disadvantages	<ul style="list-style-type: none"> - Longer for patient adjustment vs W-arch/Quad-arch - Individual tooth movement is not possible
Functional	<ul style="list-style-type: none"> - Tooth Malposition causing the deflection to 1 side as the patient closes in CO - If the mandible would be able to close without interference, there wouldn't be a crossbite -> Not a thing if there is a skeletal component involved though <p>**Clue: Posterior Crossbite to 1 side + a Midline shift to the same side -> Likely a functional shift**</p>

Removable or Fixed?

	Advantages	Disadvantages
Removable	<ul style="list-style-type: none"> - Easy to clean - Only imparts a tipping force (root movement doesn't happen = \downarrow risk of moving lateral roots into the developing canines) 	<ul style="list-style-type: none"> - Pt Compliance (doesn't wear as often as is needed) - No Torque forces applied when needed
Fixed	<ul style="list-style-type: none"> - Can provide Torque force when needed to move teeth within the alveolus - Compliance is not an issue (pt has no choice but to have braces for their grad photo) 	<ul style="list-style-type: none"> - Harder to clean and maintain OH - Possibility of root resorption/damage to the tooth +/- the adjacent teeth

Questions Provided in Class

► Which of the following are good reasons to correct a crossbite?

- Periodontal concerns
- Chipping/wearing of teeth
- Aesthetics
- Functional shift
- Your loan payment is due

You have recommended to a patient that they require crossbite correction and you have referred them to an orthodontist. They refuse the recommendation and treatment. What do you do?

- Dismiss them from your practice
- Document your recommendation in the chart
- Remind them on a subsequent visit of your recommendation

The physiologic movement of teeth in a labial/buccal or lingual/palatal direction to accommodate skeletal discrepancies is known as _____

Dental Compensation

Which appliance is best to use for skeletal expansion in an 11 year old female?

- RME
- Quad Helix/W arch
- Hawley retainer
- Orthognathic surgery

WHICH OF THE FOLLOWING ARE ADVANTAGES OF A REMOVABLE APPLIANCE?

- Three dimensional control of tooth movement
- Easy to clean
- Patients will always wear them, and will never lose them
- Cost-effective

WHICH APPLIANCE IS BEST TO USE IN A 6 YEAR OLD WITH A DENTAL ANTERIOR CROSSBITE?

- RME
- W-arch
- Hawley retainer

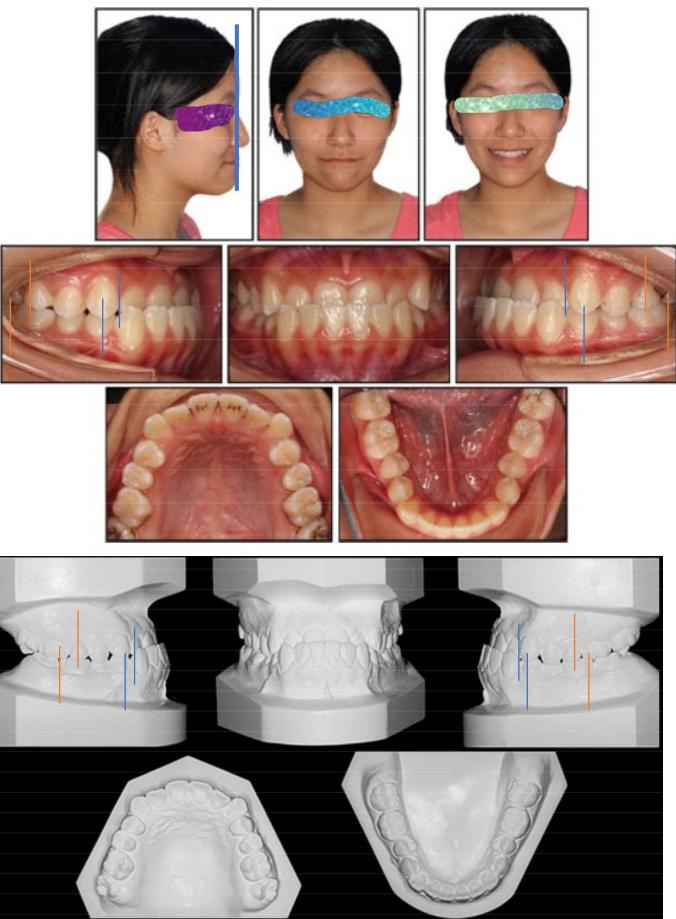
- RME
- Quad Helix
- Fixed Edgewise appliances
- Facemask
- RME and Facemask together

Diagnosis and Tx Planning

There is 1 template we should always follow to ensure we gather all the proper information:

- **Chief Complaint**
 - o **Patient Dependent.** You might see a smol problem because you are trained to look for perfection, but the patient might not have a complaint pertaining to that.
- **Patient Hx**
 - o **Craniofacial abnormalities** (Clefting), **Trauma** etc
- **Facial (Soft Tissue) analysis**
 - o **Profile Type** (most people are convex)
- **Dental Analysis**
 - o Crowding, Spacing, malpositions
- **Skeletal Analysis**
 - o **Ceph analysis** -> if it is realllyyy off surgery is needed to solve the problem
- **Functional Analysis**
 - o Functional shifts (discrepancy between Centric Occlusion and Centric Relation)
 - o **CR:** The position of the jaw when the condyle is comfortably seated anterior-superior on the glenoid fossa
 - o **CO:** The position that the teeth occlude in maximal intercuspal position

Case Example

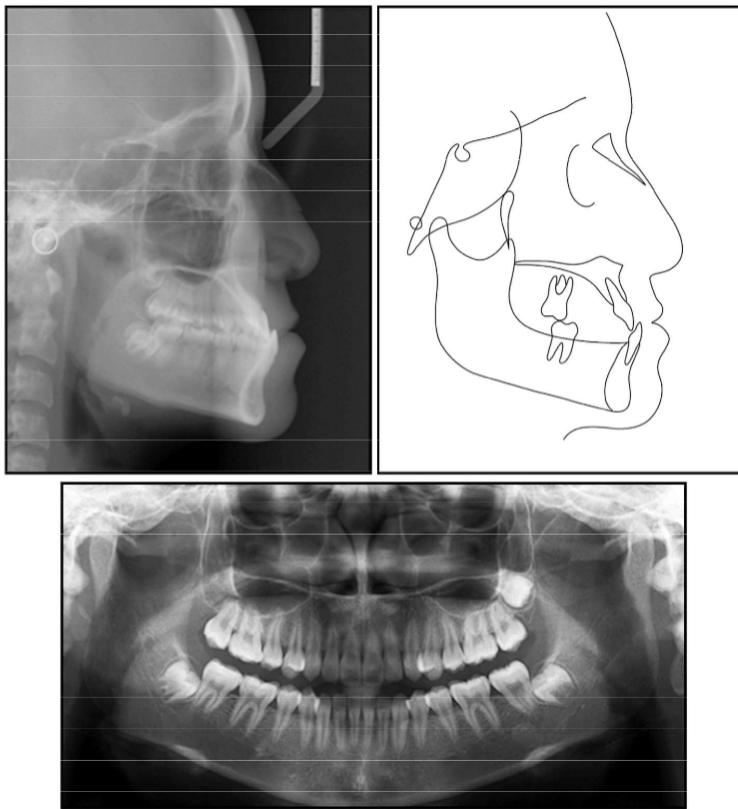


So what do we see:

- Straight profile type, or mild convex
- Proportions are even
- Anterior Crossbite
- Molar Class III (MB cusp of Max 6's are behind the B groove of Mand. 6's)
- Canine Class III (Max 3's are behind the Mand. 3-4 embrasure)
- Minor crowding

In CR we see end to end occlusion with posterior open bite ->
Shows us there is an **anterior functional shift to occlude the posteriors**





	Pretreatment	Posttreatment	Norm
Sagittal			
SNA (°)	85	85	85 ± 3.5
SNB (°)	87°	85.9	79 ± 3.0
ANB (°)	-2.0	-0.9	3 ± 2.0
Wits (mm)	-9.7	-6.5	-4.5 ± 3.0
Vertical			
Mandibular plane angle (°)	23.2	25.5	26.0 ± 4.5
N-ANS (mm)	52.9	53	54
ANS-Me (mm)	59.7	62.3	64
LFH (%)	53.02	54.03	55
Dental			
U1-MxP (°)	118.6	122.8	118 ± 6.0
L1-MnP (°)	92.7	86.3	97 ± 7.0
U1/L1 (°)	132.7	128.1	125 ± 8.0
U1-NA (mm)	8	8.64	5 ± 2.0
L1-NB (mm)	6.76	3.56	6 ± 2.5
Nasolabial angle (°)	82	80.5	110 ± 2.5
Soft tissue			
E-line-lower lip (mm)	0	-2.0	-4.0 ± 4.5

SNA	Normal - Maxilla is normal
SNB	> Mean - Mandible Prognathism
ANB	< Mean (-ve value) - Skeletal Class III
MP angle	Normal
U1-MxP	Normal
L1 MnP	Normal
U1/L1	> Mean - Teeth are Retroclined/vertical
U1-Na(mm)	> Mean - Max Incisors are slightly protrusive
Nasolabial Angle	< Mean - Not sure what this means, but it seems significant. Probably Class III

Okay, lets fill out the template now

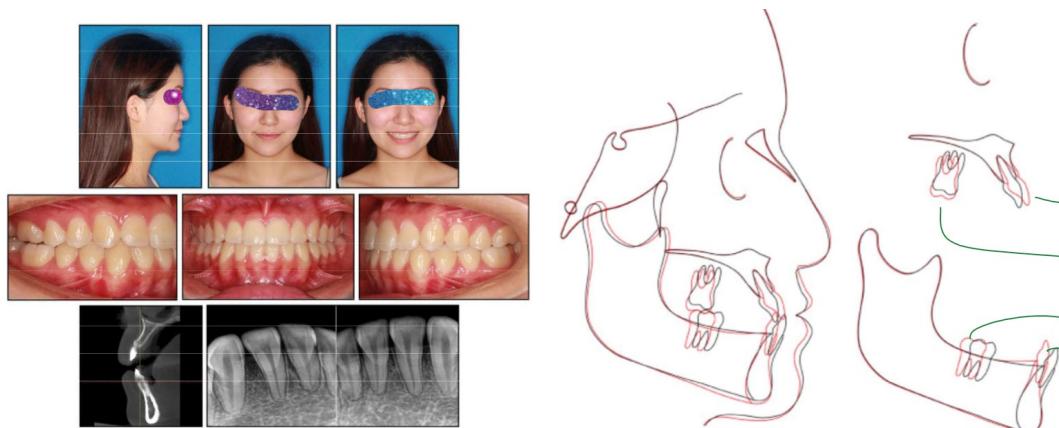
Chief Complaint	"Lower front teeth bite in front of the upper teeth"
Pt Hx	16 years old, non-growing
Facial (Soft Tissue) Analysis	Mandibular Prognathic profile Acceptable midface convexity High tension in labiomental fold No asymmetry Normal incisor exposure when smiling
Dental Analysis	Class III Canine and Molar Relationships Anterior Crossbite at CO Deep Curve of Spee in mandibular arch Mild Crowding
Skeletal Analysis	Prognathic Mandible and Retroclined lower incisors
Functional	Mandible can move slightly back to create edge to edge occlusion at CR

Tx Planning

- Oh look! A new template

Diagnosis	Angle Class III Malocclusion with mild crowding on a Class III skeletal base with mandibular prognathism
Prioritized Problem List	Objectives
1. Anterior Crossbite	Rotate mandible down and back in CR, move U1 anterior and L1 Posteriorly
2. Mandibular Functional Shift anteriorly from Edge to Edge incisors	Eliminate unstable incisor premature contact (move U1 anteriorly and L1 posteriorly) Establish posterior occlusal contact (extrude Upper posterior teeth)
3. Class III Canine and molar relationship	
4. Prognathic soft tissue profile	Rotate Mandible Down and Back
5. Mentolabial Strain	Rotate Mandible Down and Back
6. Deep Mandibular Curve of Spee (Posterior open bite)	Extrude Upper Posterior teeth, match max. curve of Spee for stable posterior occlusion
7. Mild Crowding	Expand arches
Mechanotherapy	<ul style="list-style-type: none"> - Pt Declined non-extraction full mouth fixed appliance + Orthognathic surgery (Maxillary advancement) - Pt Accepted full mouth fixed appliances with extractions of Lower 1st molars to provide space for distalization of lower dentition using mini-implants and temporary anchorage devices

Tx Completed



- Max Molars were extruded
- Max Incisors were protruded
- Mand. molars were distalized
- Mand incisors were Retruded

Biology of Orthodontic Tooth Movement

(The lecture we should have had first)

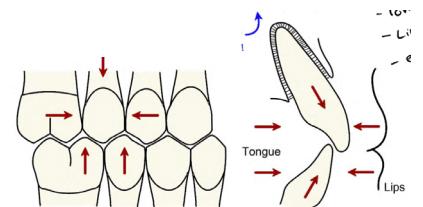
Important Concepts

Teeth are in a **state of Equilibrium** experiencing forces from: Opposing dentition, tongue, cheeks, lips etc

- If this equilibrium is disturbed, then the teeth will move as a result of the unbalanced force until equilibrium is reached again

There are 2 things necessary to move teeth:

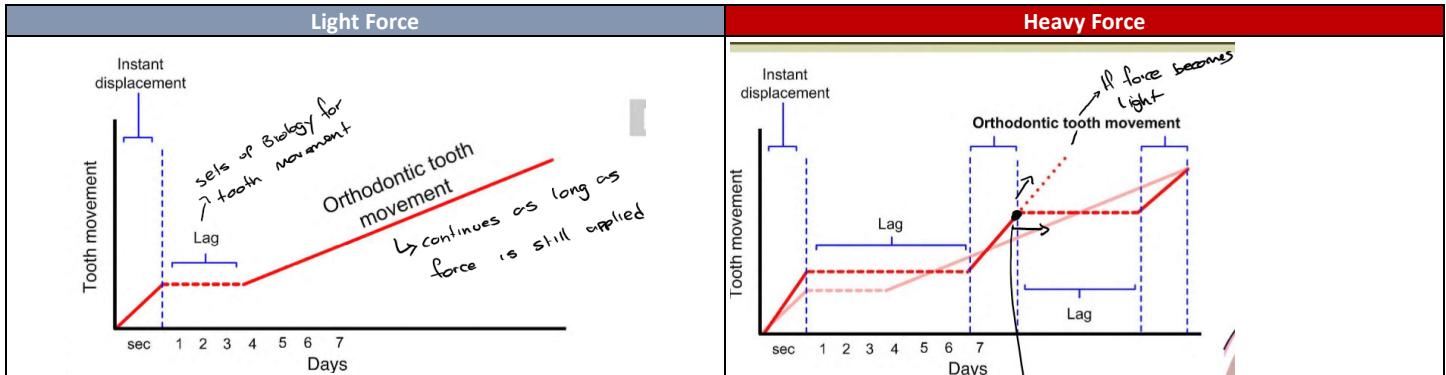
1. **Prolonged pressure**
2. **Force over the movement threshold** (>5-10 grams minimum)



Tooth movement is a **PDL Phenomenon** -> Bone resorption and deposition is mediated by the PDL as it senses compression and tension

Can Move	Can't Move
<ul style="list-style-type: none"> - Endo Tx Teeth - Previously Traumatized Teeth - Perio Compromised teeth (But you shouldn't) 	<ul style="list-style-type: none"> - Implants - Ankylosed Teeth

Light Force vs Heavy Force

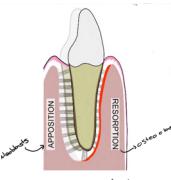


Instant Displacement (Instant):

- 0.2-0.5mm of movement. Correlates to the **width of the PDL Space** as the tooth

Lag Period (Lasts 4 days):

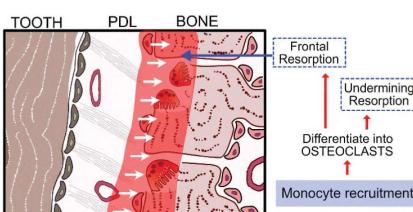
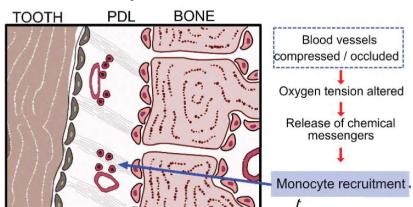
- Setting up for tooth movement
- **Osteoclasts recruited** to the leading edge for resorption and osteoblasts to the trailing edge for apposition
- **Frontal Resorption**



Orthodontic Tooth Movement:

- As long as the force is being applied the tooth will move linearly

Frontal Resorption



Monocytes/Osteoclasts are recruited from the vessels in the PDL space

Type of movement	Force*(gm)
Tipping	35-60
Bodily movement (translation)	70-120
Root uprighting	50-100
Rotation	35-60
Extrusion	35-60
Intrusion	10-20

Optimum Force:

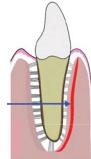
- Don't exceed capillary blood pressure (we don't want to occlude the vessels)
- **>5-10 grams**
- ↑ the force beyond a certain limit doesn't necessarily correspond to ↑ tooth movement

Instant Displacement:

- Displacement is further due to the ↑ force. **PDL is compressed more** and there might even be some bone flexure

Lag Period (Lasts 7 days):

- Longer than in light force
- **Undermining resorption** -> Bone isn't resorbed in the PDL space, but rather **inside the bone** and then resorbed towards the PDL space
- Lag takes longer because the tooth cannot move until the bone is resorbed to the PDL space.



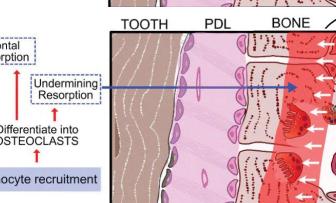
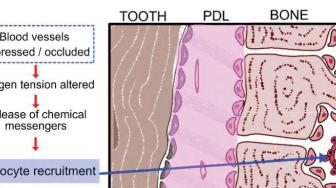
Orthodontic Tooth Movement:

- Tooth moves into the space that was opened up from the undermining resorption and then **waits in another lag phase** for the undermining to complete again
- If the force becomes light then there will be no cyclic lag phase and there will be a transition to frontal resorption

Undermining Resorption

Vessels in the PDL are completely occluded. This stimulates the space to be filled with Hyaline (Hyalinization)

- Monocytes are recruited from the marrow within the bone

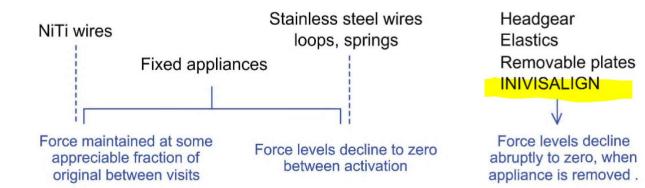
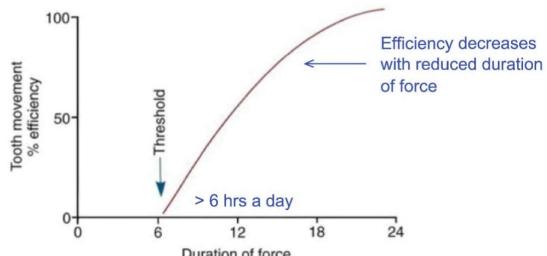


Osteoclasts eat away at the bone from the marrow side towards the PDL

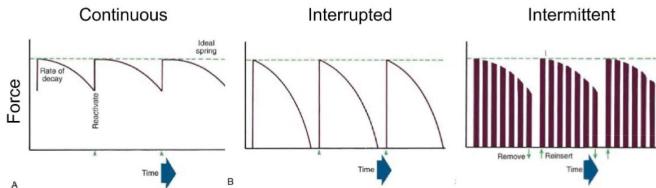
So what's the big deal?

- ↑ Mobility
- ↑ Pain
- **Root Resorption (into dentin) is greater**
 - ↑ risk with heavy force, longer treatment, genetics, amount of apical displacement and the biomechanics
 - Most ortho patients experience 2mm or less...but 3-5% of Pt can experience >5mm

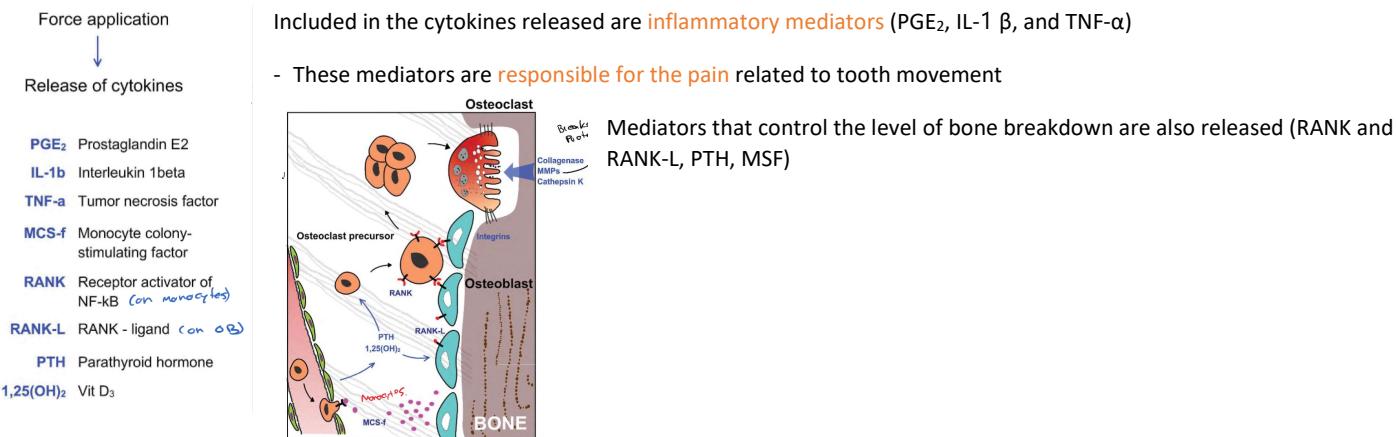
Duration of Force:



****Minimum 6hrs per day!****



Cellular Mechanisms Involved



Despite there being inflammatory mediators, **orthodontic tooth movement is NOT an inflammatory process** -> because it is **not a pathological event** (it's simply an exaggerated form of normal physiological turnover)

- It has the potential to turn pathological if there is already a pathological situation present though, like active periodontal disease

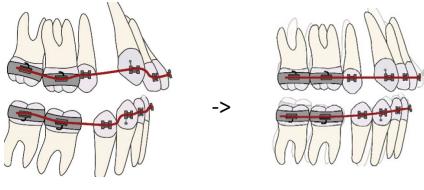
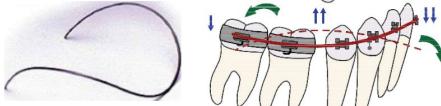
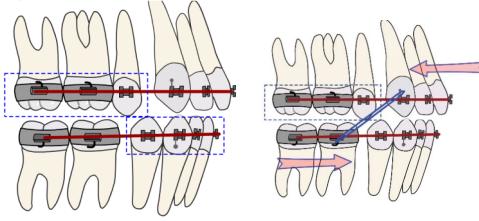
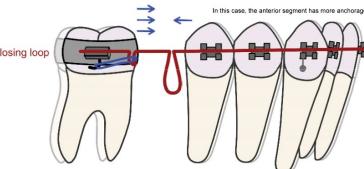
Due to these mediators, systemic factors DO affect tooth movement:

- Age, Hormonal Status, Pregnancy, Systemic Disease, Stress
- **MEDICATION**
 - o NSAIDS
 - o Bisphosphonates

NSAIDs	Bisphosphonates
<p>↓ inflammatory mediators which slows down the process and ↓ tooth movement</p> <ul style="list-style-type: none"> - Use Tylenol (Acetaminophen) because it acts in the brain (COX3) and not peripherally to ↓ inflammatory mediators <p>Osteoclast</p> <p>Osteoclast precursor</p> <p>Osteoblast</p> <p>BONE</p> <p>Collagenase, MMPs, Cathepsin K</p> <p>Integrins</p> <p>RANK</p> <p>RANK-L</p> <p>PGE₂</p> <p>MCS-f</p> <p>Monocytes</p> <p>Destroy the Osteoclasts responsible for breaking down the bone -> ↓ tooth movement</p> <p>Osteoclast</p> <p>Osteoclast precursor</p> <p>Osteoblast</p> <p>BONE</p> <p>Collagenase, MMPs, Cathepsin K</p> <p>Integrins</p> <p>RANK</p> <p>RANK-L</p> <p>PGE₂</p> <p>MCS-f</p> <p>Monocytes</p>	

Stages of Comprehensive Orthodontic Tx

Stages are different from Phases

Phases	
Phase I (Interceptive Tx): -> Mixed Dentition <ul style="list-style-type: none"> - Limited goals -> Prevent problems from getting worse later - Headgear, Functional appliances, 2x4, RPE, Habit appliances 	
Phase II (Comprehensive Tx): -> Permanent Dentition <ul style="list-style-type: none"> - Adolescents and Adults - Fixed Appliances 	
Stages of Phase II	
1. Aligning and Leveling	<p>*Bracket placement and angulation on the crown is important to dictate how the movement will result -> Align with the long axis of the tooth</p> <p>Use NiTi wires to apply light forces created by their shape memory property</p>  <p>Leveling may need additional steps to eliminate the COS in the mandible -> use a Reverse COS wire -> Don't over do it though or you can create an anterior open bite!</p> 
2. Working Stage	<p>Correction of AP relationships -> **BEFORE space closure** Space Closure</p> <p>**Important to plan anchorage so you only move the teeth you are wanting to move*</p> <ul style="list-style-type: none"> - Depends on how many stable teeth are connected in each segment  <p>Class II anchorage = Distalizes the max and mesializes the mand.</p> <p>Anchorage options:</p> <ul style="list-style-type: none"> - Headgear - Hang-Tie - TPA/Nance Appliances - Elastics - Miniscrews - Miniplates 
3. Finishing/Detailing	<p>Arch Coordination Tip and torque correction</p> <ul style="list-style-type: none"> - Correct root tip angulation <p>Level marginal ridges/contact points</p> <p>2 Options:</p> <ol style="list-style-type: none"> 1. Reposition the brackets -> and drop to NiTi wires 2. Keep the brackets in place -> Bend a heavy SS wire
4. Retention	Holds teeth in position

Andrews 6 Keys of Ideal Occlusion:

1. Good Molar Relationship (Class I ideally)
2. Correct crown angulation
3. Correct crown inclination
4. Flat or mild Curve of Spee
5. No rotations
6. No spaces



Tooth Extractions

Phase I Extractions

Phase I	
Indications	Criteria
Serial Extractions	<ul style="list-style-type: none"> ○ Severe Crowding (>8mm) ○ Molar Class I occlusion ○ Good Overjet/Overbite ○ Good Facial Profile
Primary Canine Extraction	<ul style="list-style-type: none"> ○ Incisor Liability (~1.6mm) -> >1.6mm gets iffy in the mixed dentition ○ Midline deviations ○ Impacted Permanent Canines <ul style="list-style-type: none"> ■ Extract C's by 11 yrs
Submerged/Ankylosed Teeth	<ul style="list-style-type: none"> ○ Primary D and E's ○ Vertical Bony defect ○ Tipped permanent molars/Premolars ○ Obstruction to erupting premolars

Phase II Extractions

Before you go yanking teeth, there are some considerations to make

- Vertical Overbite Consideration:

Things that Open the Bite	Things that Close the Bite
<ul style="list-style-type: none"> - Brackets - Proclining teeth buccally/Labially - Jaw Expansion 	<ul style="list-style-type: none"> - Extractions - Invisalign intrudes molars and closes the bite

Phase II		
Indications (CPAP)	Criteria	
Crowding	Extraction Crowding >8mm Upright buccal segments Posterior impaction	Non-Extraction Crowding <8mm Lingually tipped buccal segments Crossbite/Expansion needed
Incisor Protrusion	<u>Ideally:</u> <ul style="list-style-type: none"> - U1-SN = 104° - L1-MP = 90=94° - U1-L1 = 136° 	
A-P Discrepancy	Primary goal is to achieve Canine Class I -> Molar classification really doesn't matter for esthetics at all <ul style="list-style-type: none"> - Force mechanics to correct class II often = Mesialization of mandibulars and proclination of lower incisors -> Prevent this by distalizing the Max and Extracting upper Premolars Class II -> Extract Upper 4's (Distalize Max) Class III -> Extract Lower 5's (Distalize Mand + Retrude incisors)	
Facial Profile	Misconceptions -> These are all wrong! <ul style="list-style-type: none"> - Extractions cause TMD - Cause Sleep Apnea - Narrows the arch - Creates narrow smile with large buccal corridors - Dish the face Goal: <ul style="list-style-type: none"> - Lip position behind the "E" line -> Upper and lower lips relative to the nose and chin -> Exo can help this if they protrusive! 	

Ortho Management of Impacted Canines

Epidemiology	<p>Max. canine is the 2nd most common impacted tooth -> Mand. 3rd molar is #1</p> <ul style="list-style-type: none"> - Makes sense...it's the last tooth to come in <p>Prevalence: 0.25-5%</p> <ul style="list-style-type: none"> - 2x ↑ in Females vs Males - 4x ↑ Palatal impaction vs Labial impaction
Causes	<ol style="list-style-type: none"> 1. Crowding 2. Prolonged Retention / Early loss of deciduous Canines 3. Ectopic eruption 4. Alveolar clefting 5. Ankylosis 6. Cystic / Neoplastic formations 7. Dilaceration of the roots 8. Trauma 9. Primary Failure of eruption 10. Idiopathic
Diagnosis	<ul style="list-style-type: none"> - Dental History - Clinical Absence of Permanent Canines (Retained deciduous) - Radiographic localization (Pan and CBCT) <ul style="list-style-type: none"> - PA, Occlusal, Pan, Frontal and Lateral Cephs, CT Scan <p><u>Localization is important for:</u></p> <ul style="list-style-type: none"> - Tx planning - Aid in surgical exposure - Proper ortho planning for forces - Minimize potential for iatrogenic effects -> Root resorption of laterals)
Complications if they are left there	<ul style="list-style-type: none"> - Ankylosis - Root resorption of lateral incisors - Devitalisation of canines - Periodontal defects - Gingival recession - Poor root angulation
Tx Options	<ul style="list-style-type: none"> -Expose it and let it erupt on its own -Expose it and bind it to an orthodontic attachment directly (Open eruption) OR bond to a chain and replace the flap (Closed eruption) -Auto-transplantation -Extract and substitute with first premolar (will need enameloplasty for esthetics and occlusion) -No Tx (always an option)
Indications for extraction	<ul style="list-style-type: none"> - Ankylosis - External or internal root resorption - Severely unfavorable position of the canine in relation to the lateral incisors - Transposition of canine into spaces (Floor of nose etc)

Space Maintenance and Regaining

The **transition from Primary to Permanent Dentition** is very important (Mixed dentition phase)

There are 3 major things to consider:

1. Mesial Migration of lower molars relative to upper molars -> Causes Class I occlusion in ideal cases	- Mand moves more because the Lower E's are larger than the Upper E's , so there is more space for the 6's to drift (Leeway Space)
2. Some expansion of the upper arch occurs, but the lower arch sees little expansion	- Max teeth are naturally angled outward, so as they erupt more the arch expands out
3. If there is already crowding in the mand. it will only get worse	- Perm teeth are always migrating mesially, and without arch expansion to accommodate them the crowding will become more severe



Before you go ahead with maintaining or regaining the space, determine if the crowding is going to lead to extraction and ortho anyways

If you decide to extract in the future anyways you will have 2 choices:

1. Early Extraction (Serial Extractions)
 - o If crowding is pushing the teeth labially and there is risk of gingival recession
2. Late Extraction (Just before starting fixed appliances)
 - o Saves extended pre-treatment phase associated with serial extractions, but will ↑ the duration of appliance phase by several months

Space Maintenance	
Why?	<p>Prevent space loss leading to future crowding and ↓ arch length</p> <ul style="list-style-type: none"> - Early deciduous molar loss or delayed premolar eruption -> Results in mesial migration - Early anterior tooth loss or delayed eruption -> Results in Midline dental shifts <p>Trauma is the #1 cause of early deciduous tooth loss</p> <ul style="list-style-type: none"> - Caries used to be #1, but has since been de-throned
Maxillary	<p>Removable:</p> <ul style="list-style-type: none"> - Acrylic plate w/ clasps for retention to teeth (Hawley Appliance)  <ul style="list-style-type: none"> - Acrylic runs interproximal as well to create retention for the appliance <p>Fixed:</p> <ul style="list-style-type: none"> - Nance palatal arch w/ acrylic pad to anterior palate - Band and Loop - Lip Bumper 
Mandibular	<p>Removable:</p> <ul style="list-style-type: none"> - Acrylic plate w/ clasps for retention to teeth (Hawley Appliance)  <p>Fixed:</p> <ul style="list-style-type: none"> - Lingual holding arch attached to molar bands - Band and Loop 
Space Regaining	
Why?	<p>Re-establish lost space before eruption of permanent teeth -> Hope to ensure normal eruption and occlusion</p> <p>Strategies:</p> <ul style="list-style-type: none"> - Expansion Appliances -> Correct posterior crossbite - Distalization of molars that have migrated mesially -> Do this before the 2nd molar erupts, or your life is hard
Maxillary	<p>Removable:</p> <ul style="list-style-type: none"> - Acrylic plate with expansion screws - Headgear  <ul style="list-style-type: none"> -> Really impresses the boyfriends <p>Fixed:</p> <ul style="list-style-type: none"> - Brackets with active arch wires and coil springs - Maxillary Expanders 
Mandibular	<p>Removable:</p> <ul style="list-style-type: none"> - Acrylic plate with expansion screws <p>Fixed:</p> <ul style="list-style-type: none"> - Brackets with active archwires and coil springs

Fixed Vs Removable

	Removable	Fixed
Advantages	<ul style="list-style-type: none"> - Less chair time to fabricate and Adjust - Cheaper 	<ul style="list-style-type: none"> - Minimal concern for patient compliance - More efficient tooth movement
Disadvantages	<ul style="list-style-type: none"> - Requires patient compliance - Never worn adequately by patient - Easily lost 	<ul style="list-style-type: none"> - More expensive - More adjustment appointments needed - More emergency appointments - Need to monitor oral hygiene

Intro to Removable Appliances

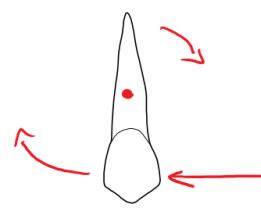
Pros:	Made in a lab (Less chair time) Can be removed by patient for social situations and hygiene Has growth guidance potential
Cons:	<ul style="list-style-type: none"> - Patient compliance is important - Tooth Movement is limited to "Tipping" only

Components



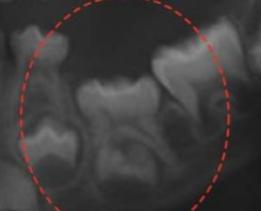
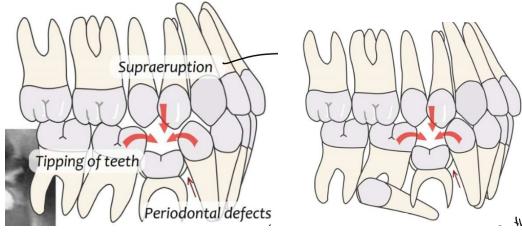
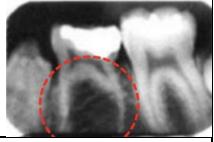
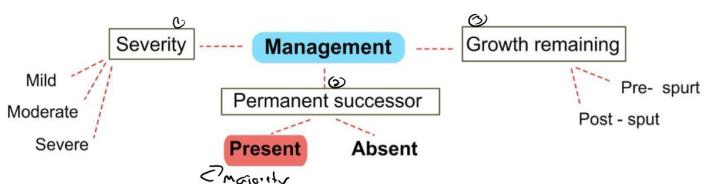
Retentive Components	<p>Clasps to hold the appliance in place</p> <ul style="list-style-type: none"> - Ball clasp - Adams clasp - Occlusal Rest - Arrow Clasps - Circumferential Clasps - Molar Tubes <p>Circumferential Adams Ball</p>	
Framework and Baseplate (Acrylic)	<p>Framework components:</p> <ul style="list-style-type: none"> - Wires (Labial bows) - Acrylic (Base Plate) 	
Tooth Moving Elements	<p>Active Elements</p> <ul style="list-style-type: none"> - Springs - Screws <p>Types of Springs:</p> <p>Overlapping Lap Springs Mousetrap Springs</p> <p>"Z" Springs Finger Springs</p>	

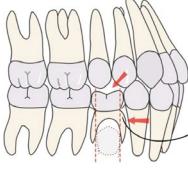
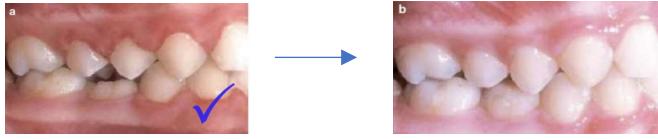
Uses

Growth Modification	<p><u>Functional Appliances:</u></p> <ul style="list-style-type: none"> - Any appliance that forces the Pt to bite in a more forward posture -> Moves them from a Class II into a Class I <ul style="list-style-type: none"> - Over time they will grow into this new occlusion - Ex: Twin Block
Minor Tooth Movement	<p>Can only impart tipping forces on teeth because they only have 1 point of contact</p> <ul style="list-style-type: none"> - For pure translation to occur the force would have to be applied directly on the center of mass of the tooth (but this is buried in bone) -> So we go with controlled tipping - Controlled tipping applied the force to the crown (above the center of mass) so only the crown will move or "rotate" over the center of the root  <p>With multiple points of contact (like in braces) full tooth translation is easier to achieve</p> <p><u>Typical Movements:</u></p> <ul style="list-style-type: none"> - Transverse and labial -> Expansion appliances  <ul style="list-style-type: none"> - Repositioning individual teeth -> Aligners <ul style="list-style-type: none"> - Spring aligners (Modified Hawley) are great for slight crowding, or for post ortho Tx if a patient hasn't worn their retainer for a while and the teeth have slightly drifted - Clear/Vacuform Aligners (Invisalign) are also good for slight movements but are WAY more expensive than Modified Hawley 
Position Retention	<p>When you want to hold teeth where they are after ortho movement</p> <ul style="list-style-type: none"> - Hawley Retainers or Essex (Vacuform) retainers <p>Make sure the Essex retainers cover ALL teeth completely. Otherwise you risk the uncovered teeth supererupting a few mm to re-contact their opposing</p> 

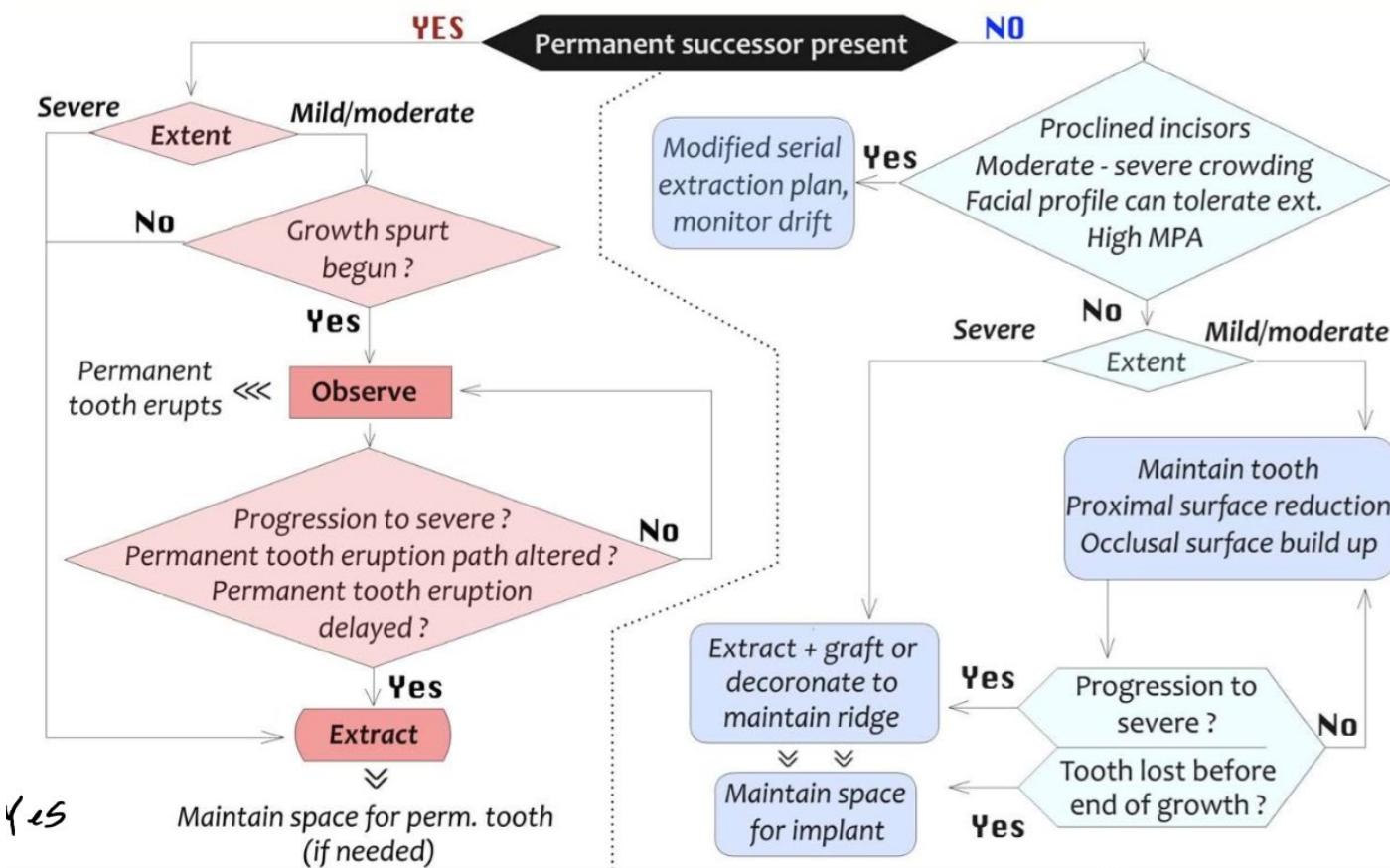
Infraoccluded/Ankylosed Teeth

Definition	= Tooth that has stopped its vertical movement relative to others along the same occlusal plane such that the marginal ridges are not the same height as the adjacent teeth
Incidence	<p>1.3-8.9%</p> <ul style="list-style-type: none"> - African American 0.93% - Caucasian 4.10% <p>Varies w/ age and population -> Develops during middle mixed dentition phase</p> <p>Younger children -> ↑ involvement of Mandibular 1st molars</p> <p>Older children -> ↑ involvement of Mandibular 2nd molars</p>  <ul style="list-style-type: none"> - Mand 2nd primary molar #1 most affected tooth - Most often in the mixed dentition phase it's the 1^o teeth that are affected the most vs the permanent teeth
Etiology	<p>Principle etiology of Infraocclusion is ankylosis btwn roots and surrounding bone</p> <ul style="list-style-type: none"> - Lack of PDL (even in small single points) causes fusion of cementum to surrounding bone <p>2 Principle causes:</p> <ol style="list-style-type: none"> 1. Trauma <ul style="list-style-type: none"> - Occurs frequently with reimplanted avulsed permanent incisors 2. Genetics <ul style="list-style-type: none"> - In primary dentition this is the majority - Siblings show high frequency of infraoccluded 1^o molars -> 18% vs the 8.9% of normal pop. - In 67% of genetics cases, multiple teeth are found to be infraoccluded in the same Pt

Diagnosis	<ul style="list-style-type: none"> Marginal Ridges of the tooth is apical to the marginal ridges of the adjacent teeth <p>**Clinically is really the only way to Dx. We cannot always see radiographically the cementum fusion if it a tiny little point **</p>	 									
Classification	<table border="1"> <tr> <td data-bbox="380 350 507 382">Slight</td> <td data-bbox="507 350 1258 382">Occlusal surface <2mm below the expected occlusal plane in the tooth</td> <td data-bbox="1269 350 1432 460">  </td> </tr> <tr> <td data-bbox="380 460 507 492">Moderate</td> <td data-bbox="507 460 1258 492">Occlusal surface is level with the contact point of one or both the adjacent teeth</td> <td data-bbox="1269 460 1432 570">  </td> </tr> <tr> <td data-bbox="380 570 507 601">Severe</td> <td data-bbox="507 570 1258 601">Occlusal surface level or below the interproximal gingival tissues of one or both adjacent teeth</td> <td data-bbox="1269 570 1432 720">  </td> </tr> </table>	Slight	Occlusal surface <2mm below the expected occlusal plane in the tooth		Moderate	Occlusal surface is level with the contact point of one or both the adjacent teeth		Severe	Occlusal surface level or below the interproximal gingival tissues of one or both adjacent teeth		
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Severe	Occlusal surface level or below the interproximal gingival tissues of one or both adjacent teeth										
	<p>**Ankylosed primary molars often start as Mild/Moderate -> Easily can become progressively worse over time**</p> <ul style="list-style-type: none"> - Vertical growth of the jaws -> All the normal teeth continue to erupt around the ankylosed teeth 										
Complications	<p>Supra-Eruption of the opposing teeth</p> <ul style="list-style-type: none"> - If tongue fills the space though there will be no supraeruption...but an open bite will develop...both shitty <p>Tipping of the surrounding teeth</p> <p>Periodontal defects (Vertical bony defect) between the ankylosed tooth and adjacent</p> <p>Midline shift towards the Ankylosed tooth side</p> <p>Loss of arch length</p> <p>Altered Eruption / Impaction of permanent tooth -> Mechanical failure of eruption</p>  										
Management	<p>3 Considerations are taken into account to determine the appropriate management strategy:</p> <ol style="list-style-type: none"> 1. Severity 2. Presence of Permanent successor 3. Growth remaining  <p>If Permanent successor is present:</p> <ul style="list-style-type: none"> - Ankylosis generally becomes progressively worse over time (Mild -> Moderate / Moderate -> Severe) - OFTEN (but not always) ankylosed teeth will spontaneously exfoliate on time (or w/i 6 months of expected) <ul style="list-style-type: none"> - 92.5% of cases - Arch length loss, alveolar bone defects and occlusal disturbance is often temporary in mild and resolves once permanent tooth comes in <ul style="list-style-type: none"> ➔ Conservative Monitoring is recommended ➔ Consider Extraction + Space management if: <ul style="list-style-type: none"> - Permanent successor has altered eruption path and will not resorb primary molar - Ankylosis is so severe that tipping of adjacent teeth is sufficient enough to prevent the permanent premolar from erupting - Time of exfoliation is significantly delayed 										

	<p>If permanent successor is absent:</p> <ul style="list-style-type: none"> - If retained 2nd primary molars last till adulthood without significant root resorption or infra-occlusion they can last decades - Need to create proper occlusion of the 2nd Primary molar – Premolars: <ul style="list-style-type: none"> - Consider Leeway space, Pulp Horns, Occlusal Surface, Root Curvature - Disking the 1^o molar is limited to the pulp horns and divergence of the roots  <p>→ <u>Consider Extraction if:</u></p> <ul style="list-style-type: none"> - Occlusal surface is below the adjacent contact points (Severe Infraocclusion). This is non restorable - If you extract early enough you can allow physiologic drifting of permanent teeth into this space -> More successful in Max than Mand (sadly Mand teeth are more affected by ankylosis) OR - Maintain the space to allow Implant placement in the future - 25% of B-L bone width is lost in the 1st 3 years after extraction -> Preserve this with bone grafting for implants, or do Decoronation if it's before the growth spurt!  <p>→ <u>Consider building up into occlusion (Composite or Crown) if:</u></p> <ul style="list-style-type: none"> - Infraocclusion is Mild or Moderate and there is little growth to occur 
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Primary Ankylosis Tx Summary:



Ankylosis of Permanent Teeth

Etiology	Trauma <ul style="list-style-type: none"> - There is a high frequency of ankylosis in reimplanted avulsed incisors
Tx	Usually monitor the tooth closely <ul style="list-style-type: none"> - Ankylosed teeth can cause iatrogenic malocclusions due to absolute anchorage of that tooth during ortho Tx  <p>**The ankylosed teeth are SOLID in there and acts as anchorage for the FEA...Now the braces will pull all the teeth upwards and you have given this guy an open bite...nice work**</p>

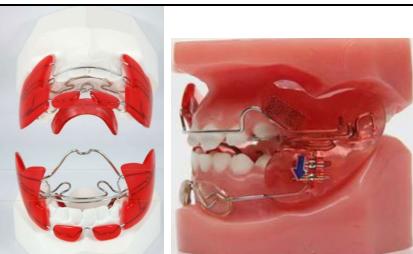
Primary Failure of Eruption

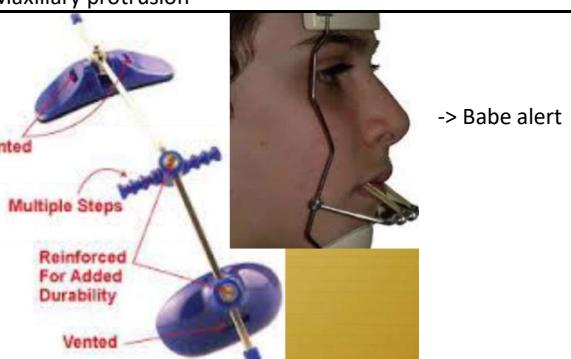
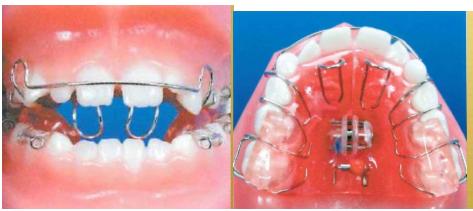
Definition	Non-Ankylosed teeth that fail to erupt <ul style="list-style-type: none"> - Possibly due to malfunction of the eruption mechanism
Facts	Posterior are affected most -> Creates open bites Teeth distal to the affected tooth will most likely have PFE also

Functional Appliances

Definition	= Device that alters a patient's functional environment in an attempt to influence and permanently change the surrounding hard tissue				
Candidates for FA Therapy	<table border="1"> <thead> <tr> <th>Children</th> <th>Adults</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> - Start FA early -> Use growth for your favor - Class II Correction: Do between 9-11 yrs old - Plenty of time to grow into new jaw relationship - Mature enough to follow instructions </td> <td> <ul style="list-style-type: none"> - Sequence and types of FA may be different than children - Respect the health of the TMJ </td> </tr> </tbody> </table>	Children	Adults	<ul style="list-style-type: none"> - Start FA early -> Use growth for your favor - Class II Correction: Do between 9-11 yrs old - Plenty of time to grow into new jaw relationship - Mature enough to follow instructions 	<ul style="list-style-type: none"> - Sequence and types of FA may be different than children - Respect the health of the TMJ
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How do they work?	<p>Strong Evidence for:</p> <ul style="list-style-type: none"> - Glenoid fossa remodeling - Dentoalveolar Changes <p>Moderate Evidence For:</p> <ul style="list-style-type: none"> - ↑ Condylar growth - ↑ Mandibular length 				
Indications (For Class II Appliance)	<ul style="list-style-type: none"> - Active Grower - Non-severe skeletal discrepancy - Retruded Mandible (Posterior positioned) - Short lower face height - Flat mandibular plane - Proclined Max. Incisors - Retroclined Mandibular incisors - Minimal crowding - Good Pt Compliance 				
Contraindications (For Class II Appliance)	<ul style="list-style-type: none"> - Class II Skeletal b/c Maxillary prognathism - Vertically directed grower - Labial tipping of lower incisors - Crowding - Poor Pt Compliance 				
Categories of FA'a	<ol style="list-style-type: none"> 1. Passive-Tooth Borne 2. Active-Tooth Borne 3. Tissue Borne 				

The Appliances

Activator	<p>https://www.youtube.com/watch?v=Z550iNX18og</p> <ul style="list-style-type: none"> - 1st widely used FA - Teeth are redirected during eruption - Large vertical opening construction bite - Couldn't speak or eat while using -> Wear it at night <p>What does it do?</p> <ul style="list-style-type: none"> - Advances Mandibular Jaw - Musculoskeletal adaptation 	 				
Bionator	<p>https://www.youtube.com/watch?v=iAdAGR0cfuQ&t=40s</p> <p>Most popular single piece appliance</p> <p>Balter's Theory of function:</p> <ul style="list-style-type: none"> - Accomplish Lip Closure (Eliminates lip traps) - Bring the back of the tongue into contact with the soft palate (Proper swallowing) - Enlarge the oral space (Expansion effect) - Bring incisors edge to edge - Produce an elongation of the mandible and improve tongue posture <p>What does the Bionator Do?</p> <ul style="list-style-type: none"> - Modifies tongue behavior to bring it into correct position -> Tongue is the main cause of Open bite and OJ and CL II and CL III Malocclusion) - Encourages normal development of the arch rather than stretching the facial muscles (like the Activators) - Less bulky (cut-down activator) - Worn day and night - Speaking is possible (palatal spring) -> Still difficult 	 				
Herbst	<p>https://www.youtube.com/watch?v=DnY5-9z4ePI</p> <p>One of the most popular Types</p> <p>Fixed FA</p> <ul style="list-style-type: none"> - Entirely tooth borne (Cemented on the teeth) - Works in 24hrs - Patient compliance is not required 😊 <p>Less Airway blockage</p> <p>Most Dentoalveolar changes when compared to other FA</p>					
Frankel Appliance	<p>The only tissue borne FA</p> <p>Acts as a template against the cranio-facial muscles will function</p> <ul style="list-style-type: none"> - Vestibular shields and anterior labial pads remove the muscle forces in the buccal and labial areas restricting the skeletal growth -> Creates an environment to enable skeletal growth <p>Best Results -> Before Permanent premolars and canines come into position (Around 9-10ish)</p> <p>SubCategories</p> <table border="1" data-bbox="328 1516 1514 1797"> <tbody> <tr> <td style="text-align: center;">FR I</td><td>Class I and Class II Div I</td></tr> <tr> <td style="text-align: center;">FR II</td><td>Class II Div 2</td></tr> </tbody> </table>	FR I	Class I and Class II Div I	FR II	Class II Div 2	 <p>*Pushes the lower lip away so it doesn't hold the jaw back</p>
FR I	Class I and Class II Div I					
FR II	Class II Div 2					

	FR III	Class III		Pads are on the Max. -> Max is underdeveloped, so the pads eliminate the force imparted by the upper lip on the jaw	
	FR IV	Open Bites and Bi-Maxillary protrusion			
Face Masks	Used for: <ul style="list-style-type: none"> - Midface insufficiency - Mandibular prognathism - Maxillary Hypoplasia - Clefts - Tongue problems  <p style="text-align: right;">-> Babe alert</p>				
Twin Block	<p>Most Popular FA currently</p> <ul style="list-style-type: none"> - Less airway blockage - ↑ speech - Can wear full time <p>Passive Tooth-Born appliance</p> <ul style="list-style-type: none"> - Made of 2 pieces that have inclined planes -> on closure the inclined planes meet and cause the mandibular arch to posture forward = Fixes the Class II 😊 - Maxillary can have attachment for the headgear if it is necessary - Can ↓ ANB by 2-3° <p>**If you are advancing the mandible you might create a crossbite with the Maxilla -> Likely will need Maxillary expansion...so build in an RME into the Max appliance**</p>				
	 <p>Twin Block for Anterior Open Bite -> Tongue cage prevents the tongue from forcing the anteriors open</p>				
	 <p>Tryax Twin Block: Claspless -> Uses the Height of contour of teeth for retention</p>				
	 <p>Boned Button Twin Block</p>				
	 <p>Evans Twin Block</p>				

	 <p>Mahoney Twin Block</p>  <p>Fixed Twin Block</p>
Klearway Appliance	<p>Mandibular Repositioning (Like the Twin Block)</p> <ul style="list-style-type: none"> - Designed originally as a Tx for snoring and mild-moderate Obstructive Sleep Apnea - Made from thermoactive acrylic - Good retention and comfort for the patient - Night wear primarily - Can titrate the mandibular advancement <p>CAUTION:</p> <ul style="list-style-type: none"> - Because it basically postures in an end to end fashion and compliance is good, it can create an edge to edge occlusion with a posterior open bite  <p style="text-align: center;">-></p>  

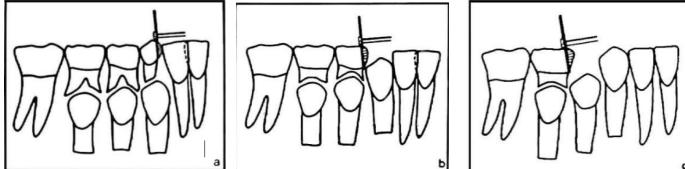
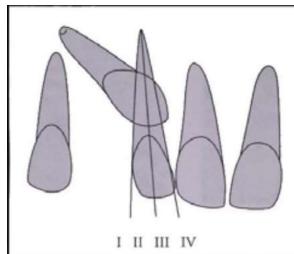
Klearway Vs Twin Block

Klearway	Twin Block
<p>+ve</p> <ul style="list-style-type: none"> - Protocol is consistent - Rarely lost - Compliance is higher (b/c night time use only) - Keeps both jaws closed while sleeping - Less chairside adjustment <p>-ve</p> <ul style="list-style-type: none"> - Doesn't allow for molar eruption or transverse expansion - Retention is compromised in mixed dentition -> But still is manageable - Can create Edge To Edge with Posterior open bite if not monitored frequently 	<p>+ve</p> <ul style="list-style-type: none"> - Protocol varies (Can be combined w/ FEA, HG etc) - Can be adjusted to allow molar eruption and width expansion <p>-ve</p> <ul style="list-style-type: none"> - Higher chance to get lost - Lower compliance due to full time wearing - No orthopedic effects during sleep if Pt is a mouth breather - Longer appointments needed to adjust - Retention is compromised in mixed dentition -> But still manageable

<u>Relapse from FA's</u>	
<u>Reason</u>	<u>Solutions</u>
<ul style="list-style-type: none"> - Inadequate time for skeletal adaptation - Continued Growth in genetically determined Pattern - Dental relapse of tipping movements 	<ul style="list-style-type: none"> - Minimum 7-9 months to ensure no dual bite - Overcorrection (Carefullllllll) - Wear slowly ↓ with regular monitoring of OJ - Recommend 1 year of ½ time wear after overcorrection

Mixed Dentition: Mild-Severe Crowding

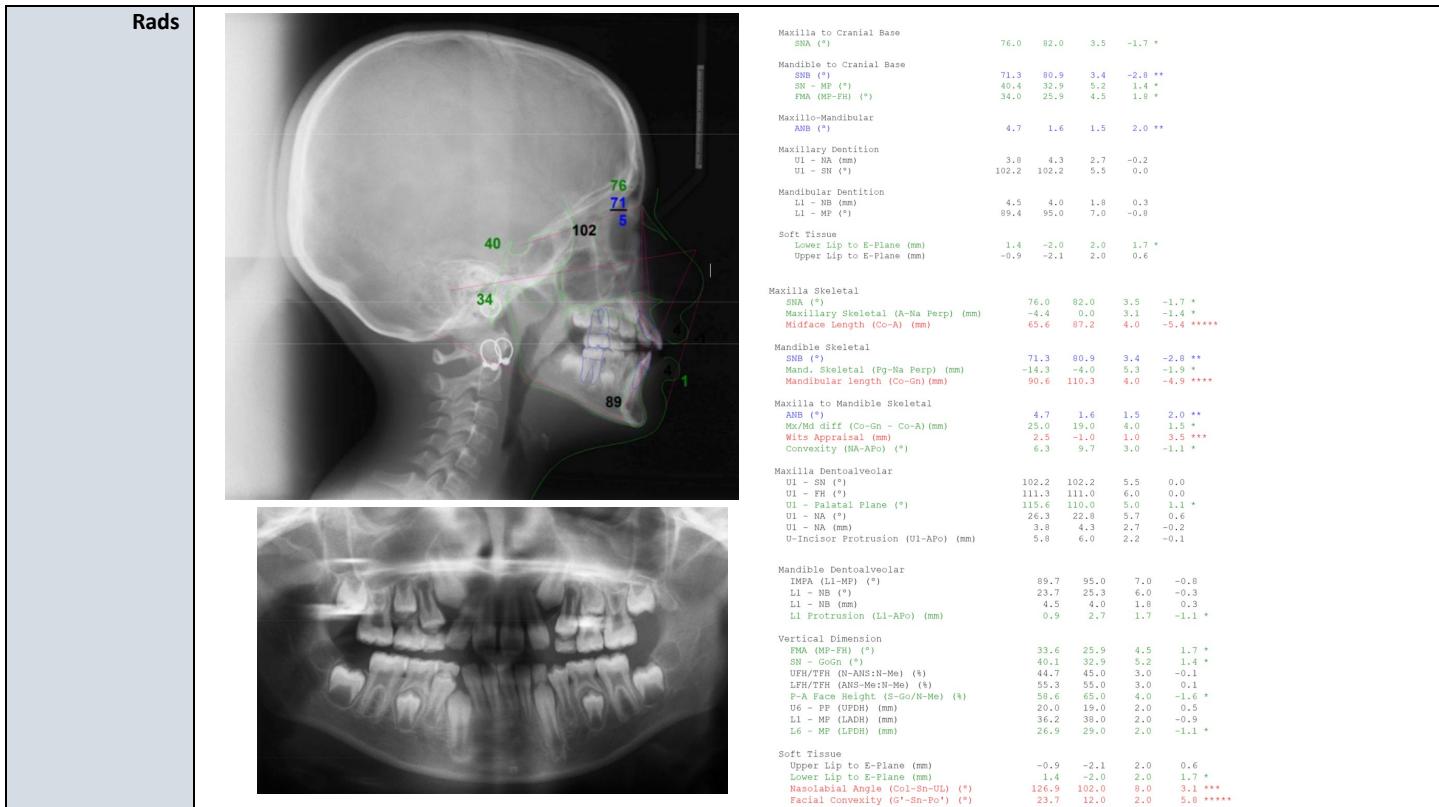
Mild – Severe Crowding Alternative Managements

Disking	<p>*ONLY disk the mesial side of teeth**</p> <ol style="list-style-type: none"> 1. Disk the mesial of the C -> Allows some of the crowing to unravel 2. Now as the Permanent Canine begins to erupt, disk some of the D -> Allows the Canine to come in fully 3. As the 1st Premolar starts to come in, disk the E -> Allows the 1st premolar to erupt. <p>**Watch out for pulp horns!**</p> 
Ectopic Canines	<p><u>Their management largely depends on how overlapped it is on the Lateral Incisor:</u></p> <p>Zone 1: Anything before the distal edge of the root Zone 2: Between the distal side and the center of the root Zone 3: Between the Center of the root and the mesial side Zone 4: Beyond the mesial of the root</p> <p>Zone 1 & 2: 91% of them self resolve and erupt normally Zone 3 & 4: 64% of these self resolve Zone 4 is likely to need uncovering to fix</p> 

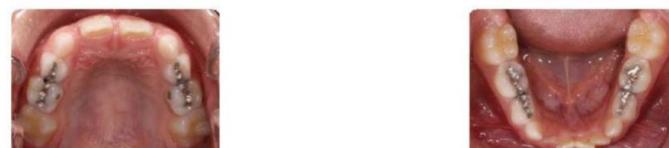
OSCE

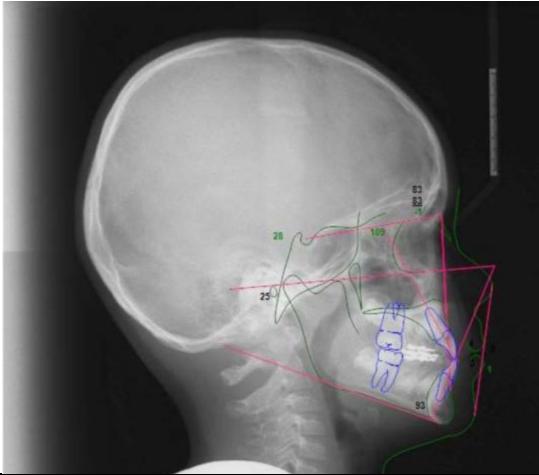
This first one is likely to be the exam case

Pt Age: 9yr 3M -> Growing with mixed dentition CC: Referred from grad pedo Habits: Thumb Sucking (Crib appliance in preschool; started sucking again at night after appliance removal) Dent Hx: Good OHE, Early loss of Upper C's	<p style="text-align: center;">Initial Clinical Photos / Composite 8</p>  <div style="text-align: center; margin-top: 10px;"> Chart# : 115980 DOB: 14/04/2008 Age: 9 12/10/2017 </div>  
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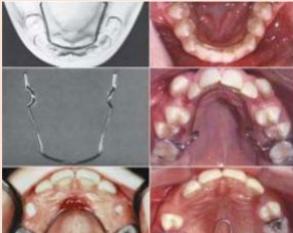


Diagnosis			
Facial	Profile: Convex Facial Type: Mesocephalic Nose: Upturned & Large Nasolabial Angle: Obtuse Labiomental Fold: Deep Chin Button: Flat Chin to Throat Length: Normal Lip Competence: Incompetent (Mentalis Strain)	Lips to E-Plane: Protrusive Lower Lip Vertical Proportions: ↓ lower facial 3 rd length Horizontal Proportions: Chin deviated slightly to the right Smile Arc: Non-consonant Tooth and gingival display: 80% Mx incisor display, 80% Mand incisor display Buccal Corridors: WNL Malar Prominence: Flat	
Dental	A-P: <ul style="list-style-type: none"> - Molar Relationship Class II (R & L) - Canine Relationship: N/A (mixed dentition) - OJ: 3mm - Incisor Protrusion: WNL Vertical: <ul style="list-style-type: none"> - OB: 10% (1mm) - Anterior Open Bite: 12/42, 22/33 - Flat CoS Transverse: <ul style="list-style-type: none"> - V-Shaped Max. Ovoid Mand. - Mandibular Midline 2mm right of facial midline - Curve of Wilson WNL Perimeter: <ul style="list-style-type: none"> - Max Crowding: Severe (9mm), blocked out 13, 23 - Mand Crowding: Severe (8mm), Blocked out 43 		
Skeletal:	A-P: <ul style="list-style-type: none"> - Class II with retrognathic Mandible and Maxilla Vertical: <ul style="list-style-type: none"> - Normodivergent growth Transverse: <ul style="list-style-type: none"> - Unilateral Posterior Crossbite with Constricted Maxilla 		

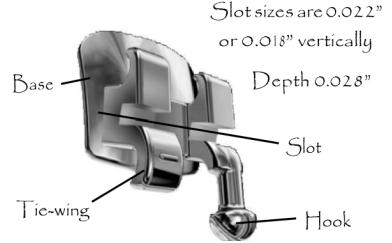
Prioritized Problem List And Tx Plan	
Problem List	<ul style="list-style-type: none"> - Severe Crowding on Max. and Mand. - Unilateral Posterior Crossbite - $\frac{1}{2}$ cusp Class II Occlusion (R and L) - Minimal OB - Mandibular Midline 2mm to the right
Objectives of Tx	<p>Max:</p> <ul style="list-style-type: none"> - AP: Class I Molar R and L, Maintain OJ - Vertical: Achieve normal OB - Transverse: Eliminate Posterior Xbite - Perimeter: Alleviate Crowding and Align teeth <p>Mand:</p> <ul style="list-style-type: none"> - AP: Class I Molar R and L, Maintain OJ - Vertical: Achieve normal OB - Transverse: Shift midline 2mm left, eliminate posterior XBite - Perimeter: Alleviate Crowding
Tx Options	<p>Option 1: (Chosen Option)</p> <ul style="list-style-type: none"> - Exo 73 - Twin Block w/ Expander and Tongue Crib +/- High Pull Headgear - Evaluate 4 premolar Exo's in 9-12 months - Full FEA - Hawley retainers +/- Crib <p>Option 2:</p> <ul style="list-style-type: none"> - Exo 73 - High Pull Headgear + RME + Tongue Crib - LLHA to preserve leeway space - Evaluate 4 premolar Exo in 9-12 months - Hawley retainers +/- Crib
Tx Outcomes (Still ongoing)	  
Another Case:	
Pt	Age: 7 Yrs -> Growing with mixed dentition CC: "Bite is off in the front"
Photo Composite	   <p>UBC DENTISTRY</p>

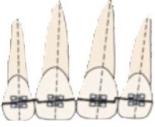
Rads		
Diagnosis		
Facial	Profile: Straight Facial Type: Mesocephalic Nasolabial Angle: Obtuse Labiomental Fold: Obtuse Chin Button: Normal Lip Competence: Competent	Vertical Proportions: Symmetric Horizontal Proportions: Symmetric Smile Arc: Normal Tooth and gingival display: Minimal gingival display Buccal Corridors: WNL
Dental	A-P: <ul style="list-style-type: none"> - Molar Relationship Class II (R &L) - Canine Relationship: Class I - OJ: Anterior Crossbite Vertical: <ul style="list-style-type: none"> - OB: End-to-End relationship Transverse: <ul style="list-style-type: none"> - Normal Perimeter: <ul style="list-style-type: none"> - Max (6-7mm)/Mand (5-6mm) crowding - Impacted 2's (Max and Mand) - Possible future impaction of 3's 	
Skeletal:	A-P: <ul style="list-style-type: none"> - Class I, Mild class III tendency Vertical: <ul style="list-style-type: none"> - Normodivergent growth Transverse: <ul style="list-style-type: none"> - Normal 	
Tx Plan		
Tx Options	<ol style="list-style-type: none"> 1. No Tx 2. Non-Exo <ul style="list-style-type: none"> - Not ideal due to extend of crowding Max and Mand 3. Extraction: <ul style="list-style-type: none"> - Exo 53, 63, 73, 83 -> Creates space for Permanent laterals - Correct anterior crossbite with tongue depressor or removable appliance with finger spring - Monitor growth (Class III Tendency) and eruption for space available (May require further exo's in the future) 	
Tx Outcomes	<p>Progress Photos May 2013</p>  <p>Progress Photos May 2015</p>  <p>Progress Photos Nov 2016</p>  <p>Patient: Troy Ssabo Chart #: 99903 DOB: 4/29/2005 Age: 11 years Date: 5/21/2015</p> <p>Chart #: 99901 DOB: 2/29/2005 Age: 11 years Date: 17/11/2016</p>	

Fixed Orthodontic Appliances

Appliances	
Transpalatal Arch (TPA) 	<p>Uses:</p> <ul style="list-style-type: none"> - Anchorage Support for braces - Fix Molar rotations - Arch Width adjustment (If pt presents with Maxillary constriction) <p>*Can be removable or Soldered*</p>
Nance Appliance 	<p>Acrylic button is used along the anterior hard palate to anchor the Max. molar position</p> <ul style="list-style-type: none"> - Space Maintenance or regaining
Lower Lingual Arch 	<p>Similar to a Trans Palatal Arch</p> <p>Uses:</p> <ul style="list-style-type: none"> - Arch width control - Anchorage Control - May hold Leeway space by contacting incisors -> Space Maintenance
Rapid Maxillary Expander (RME) 	<p>Orthopaedic expansion across the palatal suture</p> <ul style="list-style-type: none"> - There are lots of design variations:

Braces

Brackets	 <p>Slot sizes are 0.022" or 0.018" vertically Depth 0.028"</p> <p>Base Slot Tie-wing Hook</p> <p>Can Also get Esthetic brackets now -> Make out of Porcelain or Plastic</p>	<p>Slot size depends on the material being used</p> <p>Generally speaking:</p> <ul style="list-style-type: none"> - Old School practices use 0.018 -> Thinner wires to allow for flexibility - New Practices use 0.022 -> New alloys (NiTi etc) can be thick but still flexible 						
Ligation	<p>Two Types of brackets:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #FFD700;">Traditional Ligation</th><th style="background-color: #FFD700;">Self Ligation</th></tr> </thead> <tbody> <tr> <td style="text-align: center;">  </td><td style="text-align: center;">  </td></tr> <tr> <td> Nothing to keep the wire in place...so we use the fun colorful elastics \$2-\$4 per bracket </td><td> The Bracket itself keeps the wire in place...No fun elastics needed \$17-\$30 per bracket! *Don't work any better, mostly a rip off* </td></tr> </tbody> </table>	Traditional Ligation	Self Ligation			Nothing to keep the wire in place...so we use the fun colorful elastics \$2-\$4 per bracket	The Bracket itself keeps the wire in place...No fun elastics needed \$17-\$30 per bracket! *Don't work any better, mostly a rip off*	
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Lingual Brackets	<p>Lingual Ortho was a cult for a long time...it's kinda shit really</p> <ul style="list-style-type: none"> - Way more technique sensitive - Takes more time to move the teeth (Allegedly) - Less comfortable -> Ruins your tongue - More esthetic 							

<p>Bracket Prescriptions</p> <p>Prescription refers to the specific tip, torque and offset built into the bracket</p> <ul style="list-style-type: none"> - There are LOTS of options - If the prescription is right you will not have to bend the arch wire nearly as much <p><u>3 "orders" of the prescription:</u></p> <p><u>1st Order:</u></p> <ul style="list-style-type: none"> - Moving teeth In/Out of the arch -> Accomplished by the B-L thickness of the brackets vs bending a wire - Rotations <p><u>2nd Order:</u></p> <ul style="list-style-type: none"> - Tipping - Built into the offset of the bracket slots <p><u>3rd Order:</u></p> <ul style="list-style-type: none"> - Torqueing - Built into the slot angulation (and its inability to perfectly seat a rectangular wire) 	  
---	---

Sequence of Ortho Appointments

<p>1. Initial Exam</p> <p>2. Records</p> <p>3. Consultation</p> <p>4. Separators</p>	<p>These are required to create space to accommodate the thickness of band</p> <ul style="list-style-type: none"> - Typically, in place for 1 week <p>Take the Band pliers and stretch it out to "floss" in between the teeth.</p> <ul style="list-style-type: none"> - Only floss in the bottom half, the contact should be in the "donut hole" -> This prevents it from getting lodged into the gingiva 	
<p>5. Construction</p> <p>Molar Bands</p> <p>Uses: -> Test Question</p> <ul style="list-style-type: none"> - Minimal size of clinical crowns - Restoration on Buccal - Need for lingual attachments (TPA, Nance, LLHA etc) - Application of extra-oral force (Headgear) <p>**If none of these apply you can simply bond a bracket onto the molars**</p> <p>Seating:</p> <ul style="list-style-type: none"> - Place the bite stick on the Buccal of Mand molars or Lingual on Max. molars. Have Pt bite down 		

Positioning:

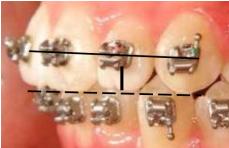
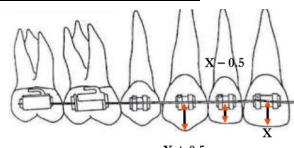
- Want the **Mesial edge of the tube** (on the band) to line up with the **MB cusp** of the Molar to prevent rotations
- Vertically, **0.5mm below the marginal ridge** and even **M-D** or you will tip the roots!




Cementing:

- **Band-Lok cement** -> Its more of a **mechanical retention** (or you would never get it off). Not a chemical bonding



	<ul style="list-style-type: none"> - Plug the tube holes with chapstick when you cement the band on to prevent the holes getting clogged <p>Bonding Brackets:</p> 																		
	<table border="1"> <thead> <tr> <th style="text-align: center;">Direct Bonding</th> <th style="text-align: center;">Indirect Bonding</th> </tr> </thead> <tbody> <tr> <td>Manually doing each bracket one at a time</td> <td>Place all brackets on cast, apply putty to take impression and pull off brackets at the same time.</td> </tr> <tr> <td>Little Prep needed</td> <td>- Apply cement and putty + brackets, let set and remove putty</td> </tr> <tr> <td>More Chair Time</td> <td></td> </tr> <tr> <td>Less Expensive</td> <td></td> </tr> <tr> <td></td> <td>Significant prepping (on models before appt)</td> </tr> <tr> <td></td> <td>Less chairtime</td> </tr> <tr> <td></td> <td>More Expensive</td> </tr> <tr> <td></td> <td>More efficient</td> </tr> </tbody> </table>	Direct Bonding	Indirect Bonding	Manually doing each bracket one at a time	Place all brackets on cast, apply putty to take impression and pull off brackets at the same time.	Little Prep needed	- Apply cement and putty + brackets, let set and remove putty	More Chair Time		Less Expensive			Significant prepping (on models before appt)		Less chairtime		More Expensive		More efficient
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	<p>*Want to place brackets in the center of the tooth, along the long axis and along a straight line*</p> <p>- use a Boon gauge to standardize the bracket placement</p> 																		
6. Adjustments																			
7. Debanding																			
8. Retention																			

Tools

Elastic Chains	<ul style="list-style-type: none"> - Used to close spaces -> Can be Open or Closed 	Ligature Tools	<ul style="list-style-type: none"> To tie SS Lig. -> Needle Driver Tuck Ligature Pig Tails -> Ligature Guide Cut Ligature Ties -> Ligature Cutter  <p>Distal End Cutters to cut the ligature -> Make sure it is a "hold" cutter, so the tail you snip off doesn't fly into the Pt's throat</p> 
Kobayashi Hooks	To use elastics	Ligatures	<ul style="list-style-type: none"> Long Ligature -> Several Teeth Quick Tie -> Single Tooth Elastic Ties -> Single Tooth 

Mixed Dentition - Skeletal and Dental Anterior Crossbite

Etiology	<p>Skeletal</p> <ul style="list-style-type: none"> - Maxillary Hypoplasia - Mandibular Prognathism <p>Dental</p> <ul style="list-style-type: none"> - Retained Primary Teeth - Trauma to Primary teeth - Supernumerary teeth - Crowding 	 
Why do we treat it?	<p>Esthetics</p> <ul style="list-style-type: none"> - Especially important in mixed dentition stage when social acceptance is very important <p>Incisal Wear</p> <p>Improve gingival recession</p> <p>↓ TMJ Pathology</p> <ul style="list-style-type: none"> - Strain on the ipsilateral TMJ causes unilateral wear <p>Stimulate Favorable Growth</p>	

	<ul style="list-style-type: none"> - Without tx one side might grow more than the other = Asymmetry
Anterior Dental Crossbite	
Characteristic Signs	<ul style="list-style-type: none"> - Single tooth involvement - CR-CO Functional Shift - Dental Class I - Arches are coordinated
Treatments	<p><u>Tongue Depressor Therapy</u></p> <ul style="list-style-type: none"> - 60 mins/day for a few weeks -> Fast correction - ONLY works if the tooth is tipped into crossbite (not if it is bodily positioned out of the arch) - Shallow overbite - Kinda need a tiger mama to force kid to do it daily -> Compliance is an issue <p><u>Removable Appliance</u></p> <ul style="list-style-type: none"> - Works for tipping only as well - Acrylic plate with a finger spring to push the tooth into place <p><u>Fixed Appliance (Braces)</u></p> <ul style="list-style-type: none"> - The only option if the teeth are rotated or bodily displaced
Anterior Skeletal Crossbite	
Characteristic Signs	<ul style="list-style-type: none"> - Multiple Teeth involved - Family Hx - Ceph Values (Low ANB <0, or a WITS of <-3) - No Functional Shift - Uncordinated arches
Tx Options	<p><u>Mandibular Excess/Prognathism:</u></p> <ul style="list-style-type: none"> - Chin Cup headgear if there is still growth - Surgery if its caught too late <p><u>Maxillary Deficiency:</u></p> <ul style="list-style-type: none"> - Protraction Headgear if still growing - Surgery if its caught too late <p><u>Dental Camouflage</u></p> 

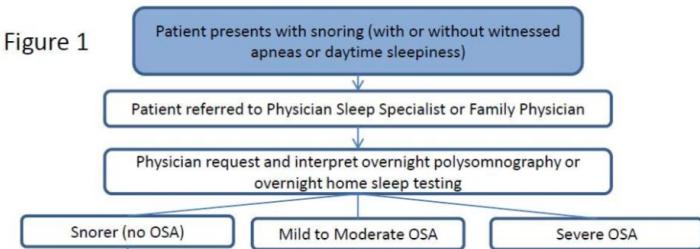
WITS and ANB Values:

ANB	WITS Measures the degree of A-P dysplasia
Up to 2 = Class I > 2 = Class II < 0 = Class III	≤-3 = Class III -1, 0, +1 = Class I >+2 = Class II

Management of Adult Obstructive Sleep Apnea Patients

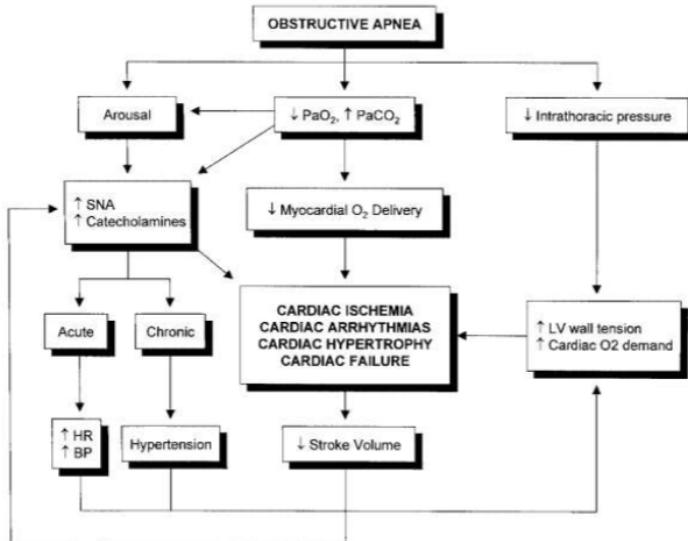
Dentists role:

- Ask Questions
- Raise Awareness
- Refer patients for Sleep Testing
- Collaborate with family physician
- Provide oral appliance therapy -> ONLY after receiving a written request/prescription from the attending physician



Medical Comorbidities

- Cardiac Ischemia
- Cardiac Arrhythmia
- Cardiac Hypertrophy
- Cardiac Failure



Treatments

OSA Severity AHI	Treatment	
Mild 5-14	No treatment	Weight loss/ Exercise
Moderate 15-29	CPAP	MADs
Severe +30	CPAP	MADs Surgery

CPAP Considerations	Mandibular Advancement Device (MAD) Considerations
<ul style="list-style-type: none"> - Cost - Clean H₂O - Electricity - Patient preference - Support for machine or equipment - Supportive partner/family - Concerns over appearance - Side Effects and discomfort - Travel becomes challenging 	<ul style="list-style-type: none"> - Cost - Clean H₂O - Patient Preference - Side Effects and discomforts - Access to dentist and dental specialist - Oral Health Status

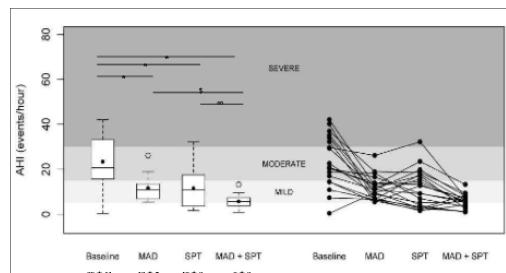
Exercise Therapy	<p><u>Exercise Prescription:</u></p> <ul style="list-style-type: none"> - 0-4 Weeks: Gradual increase in activity and exercise levels - 5-12 weeks: Full exercise regime <p><u>4 days/week</u></p> <ul style="list-style-type: none"> - 5 min warmup - 40 min aerobic workout @ 60% Max HR (Treadmill, Bike or Elliptical) - 5 min cooldown <p><u>2 days/week</u></p> <ul style="list-style-type: none"> - Resistance Training: 2 sets, 10-12 reps of 8 difference exercises
Position Therapy	<p><u>Sleep Position Trainer</u></p> <ul style="list-style-type: none"> - Keeps you in a non-supine position when you sleep -> Improves OSA vs sleeping in a supine position - Studies comparing this vs Oral Appliance show that they are about the same efficacy <p>Tennis Ball Technique SomnoPose (Phone App) Nightshift (with O₂ now) SnoreCoach</p>
Combination	Self Explanatory

When do you need more than Exercise and position therapy?

- Persistent Snoring (w/ or w/o other symptoms)
- Residual Apnea-Hypopnea Index – AHI - (w/ or w/o other symptoms) →

AHI	Rating
<5	Normal (no Sleep Apnea)
5-15	Mild Sleep Apnea
15-30	Moderate Sleep Apnea
>30	Severe Sleep Apnea

Oral Appliances + UPPP (Uvulopalatopharyngoplasty)	UPPP = Procedure that removes excess tissue in the throat to make the airway wider Oral Appliance + UPPP has better outcome than just Appliance or UPPP Alone
Oral Appliances + Positional Therapy	There is evidence showing ↑ efficacy for decreasing AHI by combining Oral Appliances (Mandibular Advance Device in this case) with Sleep Position Therapy

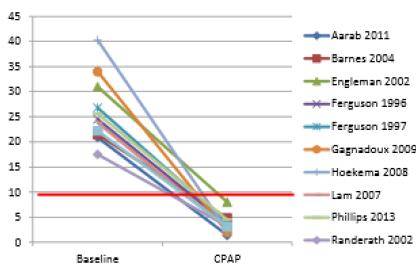


MAS vs CPAP

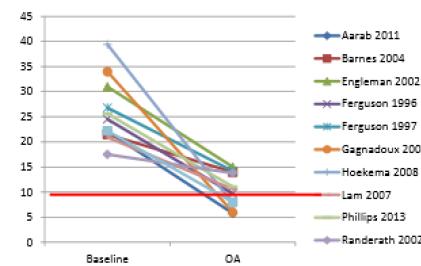
- Matching therapy to pt preferences may help Identify the most appropriate Tx → This leads to better adherence!
 - o Overall similar health outcomes of CPAP and MAS in patients with Moderate-severe OSA:
 - PROBABLY ↑ efficacy of CPAP is being offset by ↓ compliance relative to MAD

Mortality	MAS = CPAP
24Hr Blood Pressure	↓ BP ; MAS = CPAP for 24hr mean Systolic and Diastolic MAS Improved significantly the nocturnal Diastolic BP vs CPAP
Endothelial Function	↑ Endothelial function after 1 yr of Oral appliance use
Microvascular Function	↑ function; MAS = CPAP

CPAP



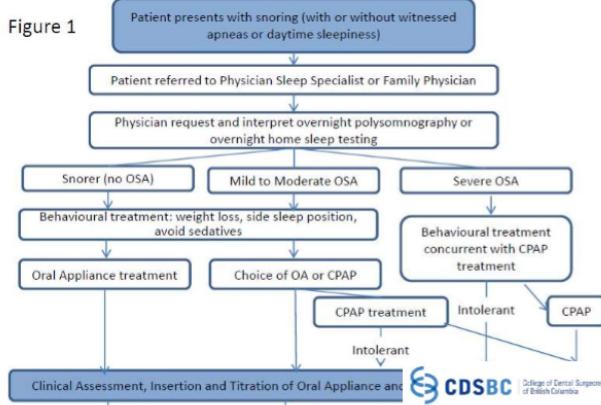
MAS



Dentists Role:

Clinical Practice Guideline for OSA and Snoring w/ oral appliances

1. Oral Appliances are recommended for adult patients who request Tx of primary snoring
2. Qualified dentists should use custom, titratable appliances over non-custom oral devices
3. Prescription of oral appliances (rather than no Tx) for adult pt's w/ OSA and are intolerant of CPAP
4. Dentists provide oversight (rather than no follow-up) of oral appliance therapy in adult patients w/ OSA
5. Sleep Testing to improve and confirm Tx efficacy
6. Return for periodic office visits (dentist and physician)



Oral Effects of Oral Appliances

- ↓ Overbite and Overjet → Retroclined Maxillary and Proclined mandibular incisors
 - Mandibular Incisors can be proclined for:
 - Relieving lower anterior crowding,
 - Class II Div 1 camouflage,
 - Class II Div 2 Malocclusion,
 - Decompensate skeletal Class III

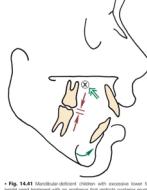
Headgears

Take advantages of growths

- Craniofacial Growth
- Dentalalveolar Growth

Types

- Depending on the direction of pull, there will be Skeletal AND dental effects

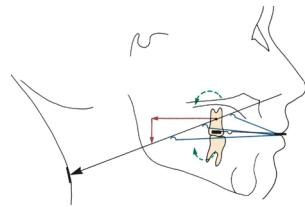
Occipital Headgear 	<p>Effects:</p> <ul style="list-style-type: none"> - <u>Skeletal</u> <ul style="list-style-type: none"> - Slow the anterior Horizontal growth of Maxilla - Slow the posterior vertical growth of maxilla - <u>Dental</u> <ul style="list-style-type: none"> - Relative intrusion due to vertical ramus growth (As jaw grows, teeth erupt more...We can hold the teeth back from erupting with the jaw to close the bite) - Minor molar Distalization <ul style="list-style-type: none"> - Pulls anchor teeth up (Intrudes) and back (Distalizes) <p>Bow Configurations</p> <ul style="list-style-type: none"> - Short Outer bow about 10° higher than inner bow - The only way to fuck it up: Low and long outer bow = distal crown tipping <p>So when?</p> <ul style="list-style-type: none"> - Class II + Open or shallow bite /Long Face <div style="text-align: right;">  <p style="font-size: small;">• Fig. 14.41 Mandibular-dental model with excessive lower face height need treatment with an appliance that restricts posterior eruption of the maxilla and forward pull on the mandible. The result is mesialization of the upper teeth.</p> </div>
Cervical Headgear	<p>Effects:</p> <ul style="list-style-type: none"> - <u>Skeletal</u>: <ul style="list-style-type: none"> - Slow the anterior growth of maxilla (Good for A-P relationship alteration) - NO control over vertical growth of maxilla - <u>Dental</u>: <ul style="list-style-type: none"> - Extrusive effects (good for making a deep bite shallower, opening the bite) - Some molar Distalization <ul style="list-style-type: none"> - Pulls anchor teeth down (extrudes) and back (Distalize) <p>Bow Configurations</p>



- Long outer bow with outer bow about 10° higher than inner bow
- How to fuck it up: Anything else will cause undesirable distal crown tipping

So When?

- Class II + Deep Bite/Short face



Combination Headgear



Effects:

- Skeletal
 - Slow anterior growth of maxilla
 - No effects on normal vertical growth
- Dental
 - Mostly a Distalization effect

Bow Configurations

- Short outer bow only, about 10° higher than inner bow

Asymmetric Headgear



Used with subdivision malocclusion

- Generally w/ cervical or combi headgear

Bow configuration:

- Outer bow longer and further out from the face on the class II side

Ortho and Pros

Comprehensive Tx planning requires collaboration of multiple disciplines **Before Tx is started**

1. Health Hx
2. **Chief Complaint -> This is #1**
3. Orthodontics
4. Prosthodontics
 - o After Ortho Tx, wait 4-6 months before pros. -> Allows recession and relapse to normalize, otherwise your esthetics from pros might be compromised

Treatment Objectives:

1. Good Final Result
2. Efficient treatment (timing)
3. Proper informed decision from Pt

Now for a bunch of fun facts



HAPPY
ORTHODONTICS

Dr. Happy S Ghag



Missing lower incisors causes an ↑ OJ problem



HAPPY
ORTHODONTICS

Dr. Happy S Ghag
10y 11m



Pt is missing Permanent teeth circled here:

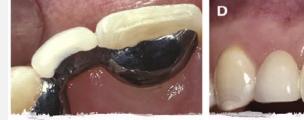
- Max Laterals
- Lower Premolars

Options:

Upper laterals:

- Remove Upper laterals -> Let canines drift in + Enameloplasty (Hard to reshape perfectly, esthetics would be weird)

- Remove Upper Laterals -> Replace w/ Maryland Bridge = Holds the space + Esthetics until implant...or keep bridge



- Remove Upper Laterals -> Replace w/ Flipper. ↓ Compliance w/ wearing it though



- Remove Upper Laterals -> Fill Essex retainer w/ denture tooth.



Sample Questions

1. What is the Single most important aspect in the multi-disciplinary care?

- a. Integration of an implant
- b. Esthetics
- c. Chief Complaint
- d. Managing staff overhead

C

2. Congenitally missing teeth in adolescence are often seen on a PA or Pan. Which statement is important?

- a. Prepare the site for implant immediately
- b. Since the patient is young, prepare the site for a 3 unit bridge
- c. Tell the patient to just live with it
- d. Manage the site w/ temporary pontic and wait for growth and development to complete prior to making a definitive plan
- e. Allow the patient to select implant vs bridge for immediate placement

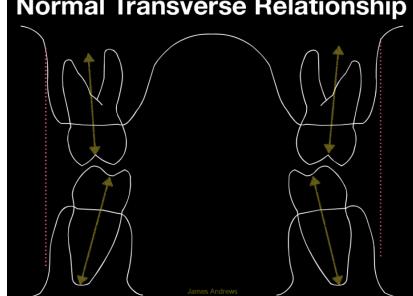
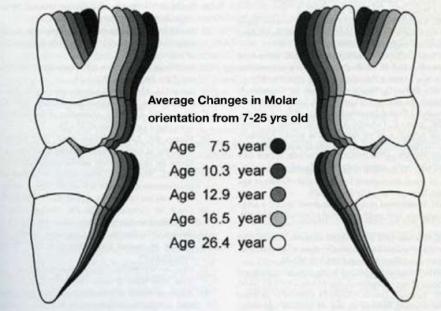
D

3. Which statement is the most accurate?

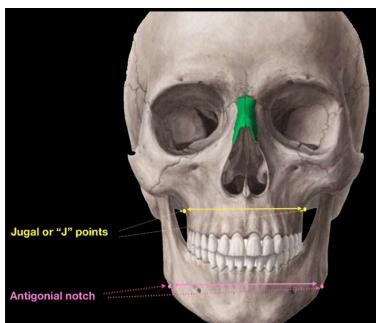
- a. Comprehensive Tx planning requires collaboration of multiple disciplines AFTER Tx is started
- b. Comprehensive Tx planning requires collaboration of multiple disciplines BEFORE Tx is started
- c. Comprehensive Tx planning requires collaboration of only 2 specialties BEFORE Tx is started
- d. Comprehensive Tx planning requires no collaboration of multiple disciplines BEFORE Tx is started

B

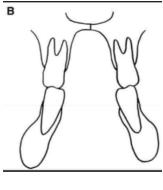
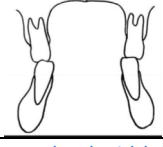
Posterior Crossbite in Mixed Dentition

<p>Normal Relationship</p>	<p>Normal Transverse Relationship</p>  <p>Normally:</p> <ul style="list-style-type: none"> - 0.4-0.7mm expansion outward/growth per year - 2.0-3.5mm of transverse growth over 5 years <p>Max Molars upright lingually by 3.3° and ↑ width by 2.8mm Mand Molars upright by 5.5° and ↑ width by 2.2mm</p>	 <p>Average Changes in Molar orientation from 7-25 yrs old</p> <p>Age 7.5 year ● Age 10.3 year ● Age 12.9 year ● Age 16.5 year ○ Age 26.4 year ○</p>
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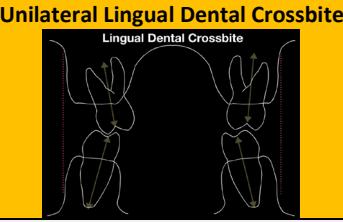
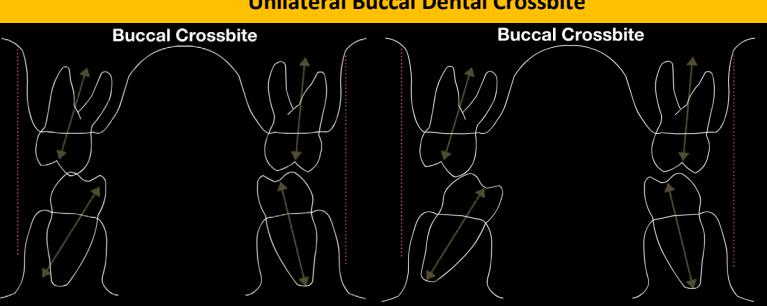
Calculating Discrepancies



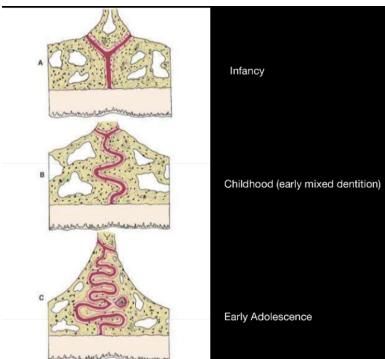
Measure the symmetry and discrepancy between the Jugal point and Antigonal Notch

CBCT Transverse Analysis Study	
Normative Data	<p>Crossbite Groups</p> <ol style="list-style-type: none"> 1. Skeletal Discrepancy in bilateral xbite is due to Narrow Maxilla + Wide Mandible, w no diff. in molar inclination <ul style="list-style-type: none"> - In unilateral xbite, b/c of wider mandible 2. In Unilateral xbites, dental compensation resulted in normal transverse relationship on that side <ul style="list-style-type: none"> - No significant difference in molar inclination - Greater Maxillomandibular width discrepancy vs control <p>Non Crossbite groups w/ Dental compensations</p>   <ol style="list-style-type: none"> 3. Superior convergent group had maxillomandibular skeletal transverse discrepancy similar to the xbite groups (Narrow Maxilla + Wide Mandible), but w/ dental inclinations that compensated for skeletal discrepancy (Masked it) <ul style="list-style-type: none"> - Superior convergence = Max Molars tipped more buccally or mand. molars tipped more lingually (Superior part of the tooth is convergent) 4. Inferior convergent group had skeletal and dental transverse discrepancy w/ maxilla <ul style="list-style-type: none"> - Inferior Convergence = Max Molars tipped more lingually, Mand. molars tipped more buccally (Inferior part of the tooth convergent)
Measures of Performance	<ul style="list-style-type: none"> - Trans-palatal width is a good predictor -> But OVERdiagnoses crossbite <ul style="list-style-type: none"> - J-Point width = least sensitive but did not overdiagnose Xbite - CBCT was almost as sensitive at TMW and was most specific <p>*CBCT is most accurate method for diagnosing crossbite</p>

Posterior Unilateral Dental Crossbite

	
A Case	Tx: Cross Arch Elastic
	 = 
	
A Case:	The Treatment: Nance Appliance w/ a powerstrap <ul style="list-style-type: none"> - They also have FEA here to align the teeth 
A Case:	The Treatment: Clear aligners + Cross arch elastics <p>Kills 2 birds with one stone: Improves the arch form as a whole AND fixes the crossbite</p> 

Posterior Bilateral Skeletal Crossbite



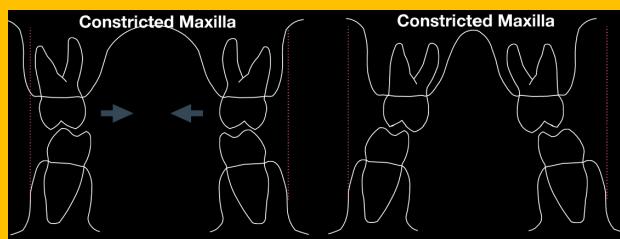
Mid palatine suture becomes more tortuous and interdigitated w/ age:

1. **Infancy** = almost straight line
2. **Childhood (Early mixed dentition)** = wavy
3. **Early adolescence** = highly interdigitated
4. **Teenager** = Bony bridging completely closes the suture

In childhood almost any type of expansion device can work (Lingual Holding arches even) -> But by early adolescent we need more force (jackscrew type appliance) to create micro-fractures before the suture can be distracted

- Once the suture has its bony bridging (Teens) Maxillary expansion without surgery is impossible

Constricted Maxilla



A Case:



Tx: Rapid Palatal Expander (Hyrax?)

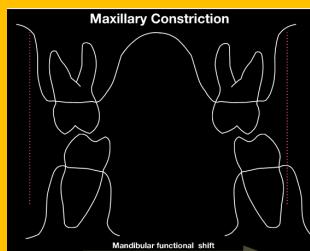


Note: As suture distract, a diastema will form. Braces after to close the space



Unilateral Posterior Skeletal Crossbite, w/ Functional Shift

Unilateral Skeletal Crossbite w/ Functional Shift

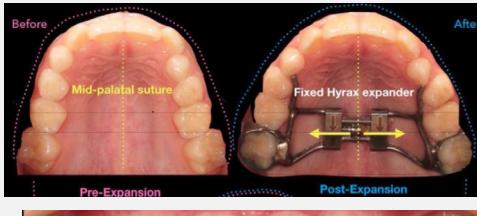


A Case:



Tx: Slow Maxillary Expansion (SME) with Fixed Hyrax Expander

- ↑ width through osteogenic distraction of the mid palatine suture + Some dental tipping



Added Selective grinding of the deciduous canine to prevent interference

Other Options for Early Tx:

- 100% effective for Quad Helix and RME's (Fixed expanders)
- Removable expanders have a 51-100% effectiveness -> Pt compliance is always shite

Fixed	Removable	No Retention
10-23% Relapse	22-25% Relapse	45% Relapse

*Tx early to prevent crossbite from being passed onto permanent dentition

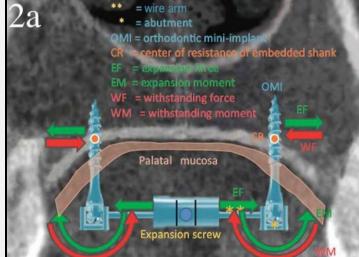
Young Adult Case



Tx: Bone Anchored Maxillary Expanders (BAME, or MARPE)



2a



Anterior + Posterior Skeletal Crossbite

A Case



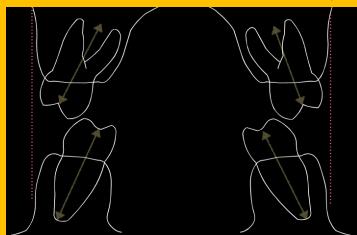
Also an impacted 11

Tx: Fixed Edgewise + Hyrex Maxillary Expander + Chain to pull the incisor out



Posterior Crossbite – Scissor Bite

Bilateral Posterior Buccal Crossbite (Scissor Bite)



A Case:

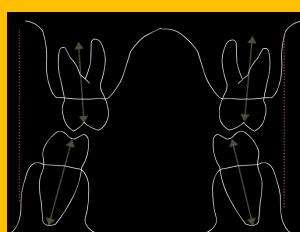


Tx: They did something...but didn't show it



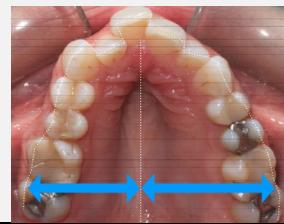
Posterior Crossbite – Skeletal Asymmetry

Unilateral Posterior Crossbite due to skeletal asymmetry



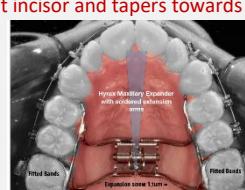
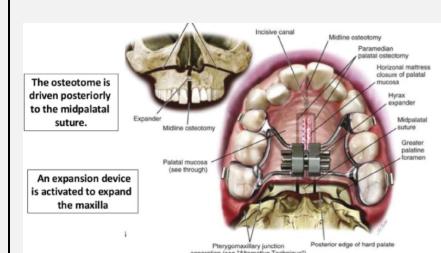
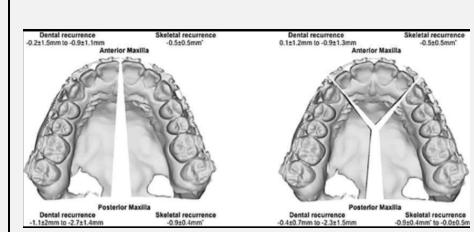
A Case

Tx: Again...no idea what they did...braces?



Disadvantages of Tooth-Borne Expanders

- Root Resorption (Premolars especially)
- Pulpal pathology
- Periodontal Compression (Ischemia)
- Venule ruptures
- More dental expansion than skeletal (Tipping)
- Acute necrotizing gingivitis
- Osseous buccal plate resorption
- Gingival Recession

Slow Maxillary Expansion	Rapid Maxillary Expansion	Surgically Assisted Rapid Palatal Expansion (SARPE)
<p>Indication:</p> <ul style="list-style-type: none"> - Younger Children (<10 years) <p>Speed:</p> <ul style="list-style-type: none"> - 1 Turn every 2-3 days (1 turn is actually like $\frac{1}{4}$ turn of the screw) - 1 Turn = 0.25mm expansion 	<p>Indication:</p> <ul style="list-style-type: none"> - Permanent Dentition (Still growing) <p>Speed:</p> <ul style="list-style-type: none"> - 1-2 turns daily - 1 turn = 0.25mm expansion <p>Effects on Sutures:</p> <ul style="list-style-type: none"> - Most ↑ in Intermaxillary Suture > Internasal Suture > Maxillonasal Suture > Frontomaxillary > Frontonasal  <ul style="list-style-type: none"> - Opening of midpalatal suture is not symmetric -> Widest at incisor and tapers towards the molar  <ul style="list-style-type: none"> - May see widening of the nasal bone (↑ effect the younger the pt)  	<p>Indication:</p> <ul style="list-style-type: none"> - Adult, Non growing  <p>*requires as much surgery as a full LeFort repositioning surgery*</p> <p>Latency Period before Jackscrew: 2-3 days Activation Rate: 1mm/day Activation Rhythm: 0.5mm 2x daily</p> <p>ONLY indicated when transverse expansion is needed (not 3D changes)</p> 

How much gain in space can we get from Maxillary Expansion?

- For every **1mm of transverse width gain = 0.66-0.7mm available arch space gain** -> its not 1:1

Posterior Crossbite OSCE

EO Images		Findings: <ul style="list-style-type: none"> - Profile: Straight (or slightly Convex) - Point of chin deviates left of midline (Functional Shift or asymmetrical jaw)
IO Images		
	Findings: <ul style="list-style-type: none"> - R. Molar Class III (likely b/c early loss of D causing mesial drifting) - L Molar Class II (Mild, 1-2mm) - L Posterior Crossbite (Unilateral) - Left C in crossbite - Lower midline shifted Left - Maxillary midline is coincident with facial midline - Maxillary mild crowding - Maxillary symmetrical Constriction - Mandibular Mild Crowding 	
Rads		Findings: <ul style="list-style-type: none"> - Probably around 8-9 Years old - Max + Manx 1st molars = 6 years - Mand. Centrals = 6-7 years - Max. Centrals = 7-8 years - Mand Laterals = 7-8 years - Max Laterals = 8-9 years - Crowding
Treatment		Hyrex Appliance for the Maxilla <ul style="list-style-type: none"> - Slow Expansion (because Pt is < 10 years old) = 1 turn every 2-3 days - Expand the arch to create space for 3, 4, 5



Lower Lingual Holding Arch

- Maintains the space for the 3, 4, 5, to erupt into
- Enameloplasty of Left C + Activation of LLHA to pull C back into the arch



Questions:

Facial	<p>Facial Type? - Straight – Mildly Convex</p> <p>Profile Type - Orthognathic</p> <p>Crossbite? - Unilateral Posterior XBite w/ Functional Shift</p> <p>What are the facial, skeletal, Dental changes associated w/ Unilateral Posterior X Bite?</p> <table border="1" data-bbox="306 868 1530 994"> <tbody> <tr> <td>1. Chin Deviation</td><td>5. Facial and Condylar asymmetry (Secondary to Xbite)</td></tr> <tr> <td>2. Dental Midline Discrepancy</td><td>6. Glenoid Fossa remodeling</td></tr> <tr> <td>3. Premature Wear of Dentition</td><td>7. Neuromuscular disharmony</td></tr> <tr> <td>4. Tilt of the Occlusal Plane</td><td>8. TMD</td></tr> </tbody> </table>	1. Chin Deviation	5. Facial and Condylar asymmetry (Secondary to Xbite)	2. Dental Midline Discrepancy	6. Glenoid Fossa remodeling	3. Premature Wear of Dentition	7. Neuromuscular disharmony	4. Tilt of the Occlusal Plane	8. TMD
1. Chin Deviation	5. Facial and Condylar asymmetry (Secondary to Xbite)								
2. Dental Midline Discrepancy	6. Glenoid Fossa remodeling								
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4. Tilt of the Occlusal Plane	8. TMD								
Skeletal	<p>Are there any Skeletal problems in the midface/Maxilla or Mandible that contribute to this Malocclusion - Maxillary Constriction (Symmetrical)</p> <p>What are the Possible Causes of Maxillary Constriction?</p> <ol style="list-style-type: none"> 1. Thumb Sucking Habit 2. Mouth Breathing 3. Trauma 4. Clefting 5. Genetics 								
Dental	<p>Describe the Dentition, AP Relationship, OB, OJ, Crowding Etc</p> <ul style="list-style-type: none"> - R Molar Class III - L Molar Class II - L Side Posterior Crossbite due to Maxillary Constriction - Functional Shift to the Left - OB: 10% - OJ: 1mm <p>Why is it important to Correct a Xbite w/ associated functional shift on the mixed dentiton?</p> <ul style="list-style-type: none"> - To avoid to changes listed above - To allow the Permanent dentition to erupt in proper occlusion 								
Prioritized Problem List	<ol style="list-style-type: none"> 1. Left Posterior XBite w/ Functional Shift of the mandible 2. Midline Deviation 3. R. Molar Class III 4. L Molar Class II 5. Mild Upper and Lower Crowding 6. Early loss of D 								
Mechanotherapy	<p>What are some examples of Expander Devices?</p> <ul style="list-style-type: none"> - Quad Helix - Hyrex - Super Screw - TPA - Removable <p>What is 1 type of expander that does not involve turning a screw at home?</p>								

	<ul style="list-style-type: none"> - Quad Helix -> Activation happens before placement in the mouth (about 3mm). Pt comes back each month for reactivation <p>What type of expander was used for this Pt? What is its advantage over removable?</p> <ul style="list-style-type: none"> - Hyrex Expander -> Advantage is efficiency. Pt compliance is not an issue here <p>What would the effect of the Palatal Expander be on an anterior open bite?</p> <ul style="list-style-type: none"> - Might make it worse -> Dental tipping buccally happens w/ Palatal expansion. Palatal cusp of Upper molars extrude a bite and that causes an ↑ in the vertical component <p>Assume the Pt has thumb sucking habit. What changes would you make to the expansion appliance?</p> <ul style="list-style-type: none"> - Add a Tongue Crib <p>What is the protocol for RME and SME?</p> <table border="1"> <thead> <tr> <th>RME</th><th>SME</th></tr> </thead> <tbody> <tr> <td>2 Turns per day - 1 turn = 0.25mm of expansion</td><td>1-2 turns per week</td></tr> </tbody> </table>	RME	SME	2 Turns per day - 1 turn = 0.25mm of expansion	1-2 turns per week
RME	SME				
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Orthodontic Finishing

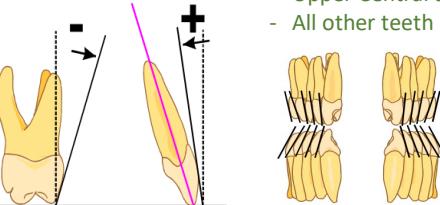
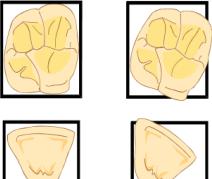
Andrews 6 Keys of Occlusion

1. Inter-Arch Relationship (Class I Occlusion)
2. Crown Angulation
3. Crown Inclination
4. Np Rotation/Alignment
5. No Spacing
6. No/Minimal Curve of Spee

****On the Exam fo shooo****

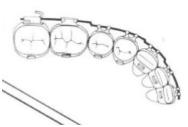
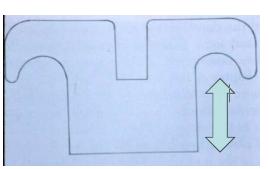
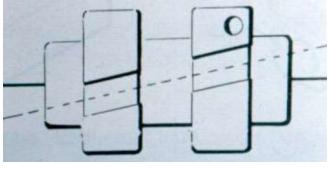
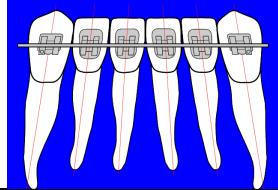
Now what do these things actually mean?

Inter-Arch Relationship	= Represents the way the upper and lower arches fit together <ul style="list-style-type: none"> - MB cusp of upper 1st molar in the B groove of Lower 1st molar - Distal incline of the DB cusp of the upper 1st molar occludes w/ M incline of the MB cusp of the lower 2nd molar
Crown Angulation	= All Crowns have a +ve angulation <ul style="list-style-type: none"> - Gingival portion of the crown should be distal to the incisal/occlusal portion
Crown Inclinations	= Crowns should have a consistent inclination pattern

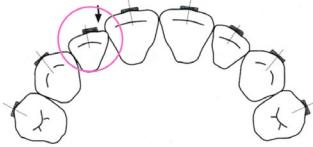
	 <ul style="list-style-type: none"> - Upper Central and Laterals have +ve Inclinations - All other teeth have Negative Inclinations
Rotations	<p>= All crowns should be free of rotations</p>  <ul style="list-style-type: none"> - Should occupy the correct amount of space to maintain a good interarch relationship - Ex: When a molar is rotated, it takes up more space -> This causes teeth anterior to it to be more class II and/or crowded
Spacing	<p>= Contact points between teeth should connect, unless a discrepancy exists in the M-D diameter of a crown</p>  <ul style="list-style-type: none"> - This spacing preserves the aesthetic and functional quality of the arches
Curve of Spee	<p>= Depth of the COS should range from Flat-slightly concave (No greater than 1.5mm)</p>  <ul style="list-style-type: none"> - Straight line from 2nd molar to Central Incisor -> The curve under this line shouldn't be larger than 1.5mm

Andrews Straight Wire System

- Action for the Brace is the wire Bracket interface
- Andrews designed his system around the brackets instead of the classic wire bending way that was previously done.

Mechanics	
1st Order Bend: - In-Out	<p>= Bracket Base</p> <p><u>Traditionally</u>: Had to put an individual dog leg bed in the wire for each tooth based on the different sizes</p>  <p>-> Andrew said "This is bullshit and sucks" so he created different sized bracket bases to automatically adjust the distance of the wire from the tooth (in-out). Smart boi</p>   <p>Larger the tooth -> Thicker the base</p>
2nd Order Bend: - Tipping	<p>= Angulation of the Slot</p> <ul style="list-style-type: none"> - Teeth all have a slight distal tipping  <p>Angulating the bracket slots will create a tipping force on the teeth 😊</p> <ul style="list-style-type: none"> - Also by distally tipping the teeth, we keep the roots parallel and nicely separated 
3rd Order Bend:	<p>= Torque applied from square wire in the slot of the bracket</p>

<ul style="list-style-type: none"> - Inclination 	<ul style="list-style-type: none"> - Angular change in the bracket doesn't allow the square wire to seat nicely in the slot -> this will create a torqueing force and change the inclination of the tooth. -> Won't work with a round wire! - Make sure all the brackets line up on the same plane
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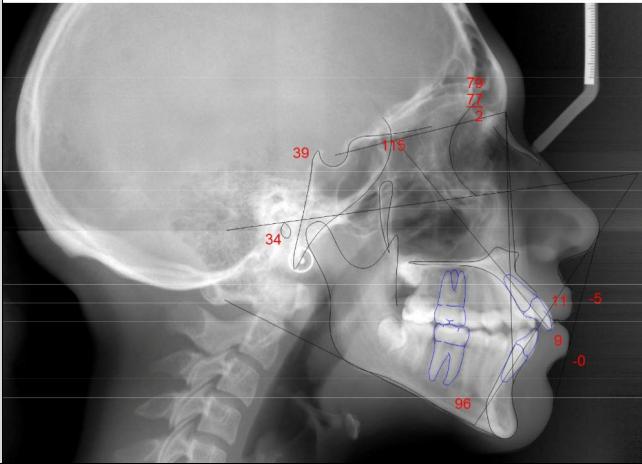
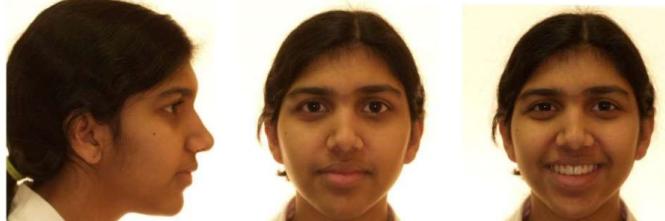
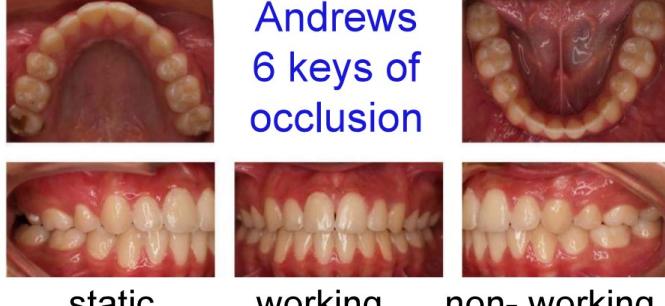


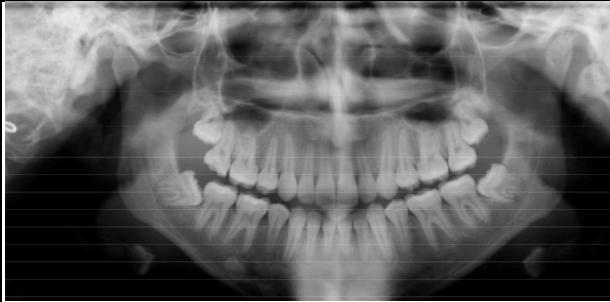
Important: This system is great and all, but it **doesn't eliminate the need for proper bracket positioning....You can still completely mess up if your brackets are not placed correctly in the tooth -> CENTER the brackets, M-D and Incisal-Gingivally**

Equilibrium Theory	Everyone's arch is a different shape.	<ul style="list-style-type: none"> - There is an equilibrium formed between the physical limitations of the shape and size of the jaw and the forces imparted by the lips, tongue, cheek etc - Choose the arch wire shape that most fits into this equilibrium...otherwise you will do all of this work and it will fall right back where it was
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A Case Study

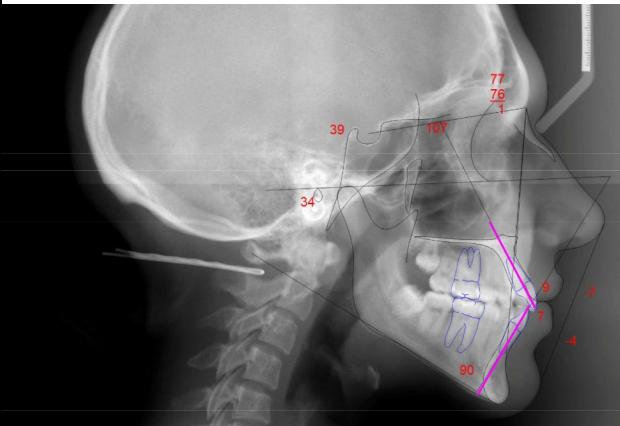
Photo Composite	 	Bilateral posterior crossbite Maxillary constriction Some Crowding (Mild-moderate) Molar Class I Canine ½ cusp class II ↑ OJ
Pan		Quad 4 Dense Bony Island Shit crown on 17

Lateral Ceph		<p>Skeletal Class I (ANB)</p> <ul style="list-style-type: none"> - Norm = 1.6 ± 2 <p>Vertical Grower (Mp)</p> <ul style="list-style-type: none"> - Dentition is Protrusive (U1-L1) - Norm 130
ABO Index	<ul style="list-style-type: none"> • Overjet - 2 • Overbite - 0 • Ant Open Bite - 7 • Post Open Bite - 6 • Crowding - 7 • Occl - 0 • Lingual xbite - 5 • Buccal xbite - 0 • Ceph - 4 • Other - 0 <p style="text-align: center;">• TOTAL SCORE = 31</p>	
Tx Plan	<ul style="list-style-type: none"> - Extract Upper 1st, Lower 2nd Premolars - RME - FEA to align, close the space and detail - Elastics to close the open bite - Removable retainer long term to maintain - Reassess 3rd molars 	
Result	 <p>Andrews 6 keys of occlusion</p>  <p>static working non- working</p> <p>Curve of Spee and Curve of Wilson Crown Inclination</p> 	<p>Interarch Relationship:</p> <ul style="list-style-type: none"> - MB cusp of upper 6 is in B Groove of lower 😊 <p>Rotation</p> <ul style="list-style-type: none"> - Teeth look fairly straight <p>Spacing</p> <ul style="list-style-type: none"> - No apparent spacing <p>Crown Inclination:</p> <ul style="list-style-type: none"> - Canine guidance w/o working side interference = Good Crown inclination (B-L cusps are on flat plane) <p>Curve of Spee</p> <ul style="list-style-type: none"> - Appears flat 😊



Crown Angulation

- Roots are parallel and crown angulation appears good



Crown Inclination

- Incisors are now at a proper inclination

Scoring the Final Evaluation

4-12-2010 for print use only.
For electronic submission requirement –
use ABO Case Report Work File (.pdf).

ABO Cast-Radiograph Evaluation

Case # _____ Patient _____
Total C-R Eval Score: _____

Alignment/Rotations

Occlusal Contacts

Marginal Ridges

Occlusal Relationships

Buccolingual Inclination

Overjet

Interproximal Contacts

Root Angulation

INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

- Lose 0-1-2 points per tooth
- Max. 2 points loss per tooth per component
- Low score = better
- 2nd molars are involved and impact the score!

^ We don't need to know the specific numbers, only the categories

ABO Measuring Gauge



- A** This portion of the gauge is in 1 mm increments and is used to measure discrepancies in alignment, overjet, occlusal contact, interproximal contact, and occlusal relationships. The width of the gauge is 0.5 mm.
- B** This portion of the gauge has steps measuring 1 mm in height and is used to determine discrepancies in mandibular posterior buccolingual inclination.
- C** This portion of the gauge has steps measuring 1 mm in height and is used to determine discrepancies in marginal ridges.
- D** This portion of the gauge has steps measuring 1 mm in height and is used to determine discrepancies in maxillary posterior buccolingual inclination.

ABO-CRE Score (Cast and Radiographic Evaluation) -> NEED TO KNOW INFO

Alignment

Marginal Ridges (Height)

Buccal-Lingual Inclination

Overjet

Occlusal Contact

Occlusal Relationship

Interproximal Contact

Root Angulation

Total Score

Big Pass = < 20

Barely Pass = 25-27

Fail = > 30

Which Scores are affected by what?	
NEED TO KNOW INFO	

Appliance Placement	<p>Alignment - If not in the center = tooth rotation</p> <p>Marginal Ridges - Bracket is too high or low on the tooth = Intrusion or extrusion = affects the occlusal contact</p> <p>Occlusal Contact</p> <p>Root Angulation - Not in center? Now the roots are not parallel, nice work</p>
Orthodontic Mechanics	<p>B-L Inclination</p> <p>Overjet</p> <p>Occlusal Relation</p> <p>Inter-proximal Contact</p> <p>**It is extremely difficult to place EVERY bracket (24-28) perfectly**</p>

Debonding and Retention

* Before you go and take all your hard wear off the teeth, view the patients smile from straight on and ask them for their esthetic approval*

- Assess excursive movements also -> Ideal is Canine rise on both sides without non-working side interference

Appliance Removal

Typically done in 2 appointments

Appointment 1	<ul style="list-style-type: none"> - Remove the Appliance - Prophy the teeth - Take impression for final records + retainer design - Final photos and radiographs
Appointment 2	<p>*0-3 days after appointment 1*</p> <ul style="list-style-type: none"> - If you wait 7+ days then the relapse could already be visible - Retainer Delivery

Debanding	<p>Use debanding pliers with very controlled movement to avoid injury</p> <ul style="list-style-type: none"> - TRIPLE check for sub-gingival Band-Lok....could cause gingival abscess if you leave some behind 
Debonding	<p>If possible, leave the arch wire tied to brackets</p> <ul style="list-style-type: none"> - Debond the brackets and take the arch out as one unit <p>Bond isn't super strong against sheering forces -> So apply a "twisting" sheering force with the pliers and the brackets should pop right off</p> 
Composite Removal	<p><u>Hand Instruments</u></p> <ul style="list-style-type: none"> - Scalers (used only for large chunks or band cement) - Deband/Debond pliers -> way better than scalers <p>*Don't use the corner of the pliers -> Can scratch the enamel*</p> <p><u>Handpieces and burs</u></p> <ul style="list-style-type: none"> - Slow speed handpiece + 12 fluted carbide finishing burs - No Water - Use a scaler to detect the remaining composite - V. light pressure, you don't want to cut any enamel by accident!  

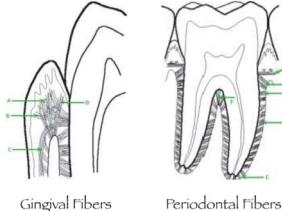
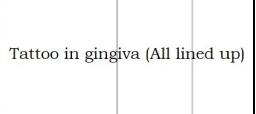
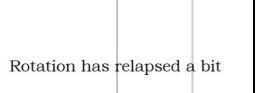
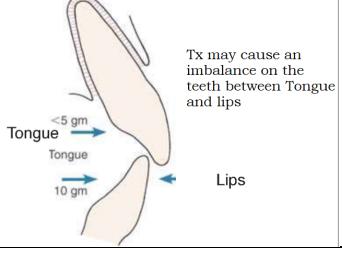
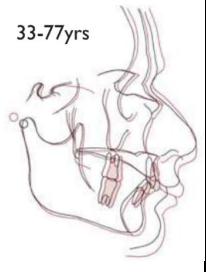
Retention

This should be a part of your overall Tx plan that you have thought about since day 1:

- i. Leveling and Aligning
- ii. Vertical Correction
- iii. A-P Correction
- iv. Finishing
- v. Retention

Relapse	
= The tendency for teeth to return to their original positions after active ortho movement	
Intra-arch Alignment	Teeth relapse into crowding again
Inter-arch Occlusion	Relapse from Class I occlusion to Class II/III/Crossbite

Major Causes of Relapse (Common exam question)

Periodontal & Gingival tissues <ul style="list-style-type: none"> - Short Term + Intra-arch relapse 	<ul style="list-style-type: none"> - PDL remodeling occurs with normal tooth movement -> Leads to widened PDL space and slight tooth mobility (class I or even class II sometimes) - Elastic gingival tissues are stretched during treatment -> Over time they want to recoil back <ul style="list-style-type: none"> - This is the main cause of short-term relapse - Takes 12 months (slow) for the elastic supracrestal fibers to remodel <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>Gingival Fibers Periodontal Fibers</p> </div> <div style="text-align: center;"> <p>Lower 3 rotated</p>  <p>Tooth released</p>  </div> <div style="text-align: center;"> <p>Tattoo in gingiva (All lined up)</p>  <p>Tissues have moved!</p>  <p>Rotation has relapsed a bit</p>  </div> </div>
Teeth moved into an inherently unstable position <ul style="list-style-type: none"> - Intra-arch and inter-arch relapse 	<p>Tooth position is maintained by an equilibrium of forces between the Tongue and the Lips</p> <p>*Especially an issue with arch expansion or proclination of anterior teeth (2mm+)*</p> <ul style="list-style-type: none"> - Forces of the lips and cheeks tend to push the teeth back <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>Tongue Lips</p> <p>Tx may cause an imbalance on the teeth between Tongue and lips</p> </div> <div style="text-align: center;">  <p>33-77yrs</p> </div> </div>
Latent Growth <ul style="list-style-type: none"> - Long term inter-arch relapse 	<p>Most ortho patients are young -> Growth continues into the late teens and even adulthood (Especially the mandible)</p> <ul style="list-style-type: none"> - Long term changes in jaw position from growth can indirectly cause crowding and occlusion changes as teeth are moved into a position of soft tissue imbalance <p>Cephalocaudal Gradient of growth</p> <ul style="list-style-type: none"> - Structures further away from the brain row more and later in life than structures closer to the brain - This is true of the Maxilla and Mandible -> Mandible grows more and for longer than the maxilla

Do 3rd molars cause crowding?

- Short Answer: **No**
- Longer answer: **No.**
 - o Usually orthodontic treatment is finished in teens around 12-13 years old...after **another 4+ years of growth we see some relapse due to the latent growth issues...but this happens to correspond with the eruption of Wisdom teeth**, so there is a false association placed on these teeth as patients think it is the 3rd molars causing the crowding

Retainers

= Appliance that provides **LIGHT** and **CONTINUOUS** resistance to relapse forces

General Retention Principles

- **4 months of full time** retainer wearing + **12 months night-time wear**

UNLESS...

1. Pt actively growing
2. There was significant arch expansion done

Types of Retainers

Choice is based on:

- Compliance
- Oral Hygiene
- Convenience
- Effectiveness

Removable	<p>Hawley Type</p>  <ul style="list-style-type: none">- Durable- Great for holding Deep bite and Transverse corrections- Versatile -> Wrap-around Hawley, Can add additional springs/clasps, Acrylic on labial bow <p><i>Indications:</i> -> Deep bite, posterior crossbite</p> <p>Vacumform Type (Essex)</p>  <ul style="list-style-type: none">- Clear and relatively esthetic- Quick and easy to make- Less durable 😞- Hold individual teeth well -> Non-modifiable though
Bonded	<p>Lingual Wires</p>  <ul style="list-style-type: none">- Great for long term retention- Best for holding spaced closed- No need to worry about patient compliance- OH is more difficult 😞 <p><i>Indications:</i> -> Diastemas, Non-compliance</p>
Adjunctive Procedures	<p>Circumferential Supracrestal Fiberotomy</p> <ul style="list-style-type: none">- Make crestal incisions after the Ortho is done so the PDL and gingival fibers will reattach to the new tooth position- Best for rotations and performed at the time of debanding <p>*Most people are not stoked on the surgery though and go with the retainer option</p>

So a patient comes to your General Practice office for a recall and you find minor relapse, patient wants it fixed

Tx Options	<ul style="list-style-type: none"> - Do Nothing - Adjust/Squeeze their original retainer onto them and make them wear it more - Make a new active retainer (Hawley + finger springs) - Limited or full fixed appliance (again)
Active Retainers	<p>Spring Aligners</p>  <p>Lab sections the crooked teeth and then re attaches them to the cast straight -> they then make a retainer for the straightened cast</p> <ul style="list-style-type: none"> - Very effective for minor movements <p>Sequential Aligners</p> <ul style="list-style-type: none"> - Digitally scan and move the teeth in question -> Software will create stepwise models to 3D print. Make vacuform trays for each model, patient works through the retainers until the final straightening is done...then they keep wearing the last one 

Dental Anomalies

Missing Teeth

Most Common missing teeth	<ol style="list-style-type: none"> 1. 3rd Molars 2. Mandibular 2nd Premolars 3. Maxillary Laterals 4. Maxillary 2nd Premolars
Treatment	<p>Replace the missing tooth -> Costly!</p> <ul style="list-style-type: none"> - Ortho Tx - Prosthetic replacement - Adjunctive procedures (CBCT/ Grafting) -> For implant options - Maintenance of the prosthesis <p>Space Closure -> Eliminates the replacement costs</p> <ul style="list-style-type: none"> - Not suitable for every case though

Missing 2 nd Premolars	
When will you know they are missing?	<p>Age: 8-9 years</p> <ul style="list-style-type: none"> - Compare to 1st premolar, if you see the 1st you should see the 2nd - Compare to opposing arch - Check family Hx -> there is a genetic component
Associated Findings *When you find 1 anomaly, look for more*	<p>These are associated w/ missing 2nd premolar:</p> <ul style="list-style-type: none"> - Missing upper laterals - Peg laterals - Ectopic Maxillary canines - Infraoccluded primary 2nd molars - Distoangular primary 5's (if present) - Mesioangular 7's
Management	<p>Options:</p> <ol style="list-style-type: none"> 1. Leave 1^o molars +/- occlusal build up +/- Disk the M and D <ul style="list-style-type: none"> - Only if the molar isn't ankylosed or in severe infra-occlusion 2. Extract -> <u>Hold Space</u> -> <u>Restore</u> (Implant/PFD) 3. Extract -> <u>Close space</u> (Mesialize the molars) 4. Extract early -> <u>Allow natural drifting</u> to close space 5. <u>Transplant</u> <div style="display: flex; justify-content: space-around;">   </div> <p>85 is in good shape and in class I occlusion -> Disk interproximal and build up occlusal</p>

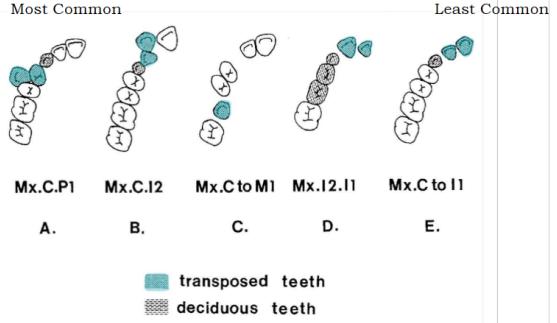
Missing Maxillary Laterals	
Incidence	<p>1-2% of population 20% of all absent teeth</p> <p>*Bilateral agenesis is more common than unilateral agenesis*</p>
Tx	<ol style="list-style-type: none"> 1. <u>Develop the site for implants</u> <ul style="list-style-type: none"> - Encourage canine to erupt mesially (close to central) to preserve bone -> Then Distalize it orthodontically <ul style="list-style-type: none"> - Extract Primary Canine at 10-11 yrs - Move Permanent canine close to central (naturally) - Distalize the canine to class I (Crown and root translation) 2. <u>Open the Space + Prosthetic replacement if:</u> <ul style="list-style-type: none"> - Class I or III dentition - Spacing is present - Asymmetrical tooth loss - Pointed canine (unesthetic) - Yellow canine (unesthetic) - Pt is fine with the costs of a prosthetic replacement (implant usually) 3. <u>Close the Space + Canine substitution if:</u> <ul style="list-style-type: none"> - Class II Dentition - Crowding - Tooth size is small - Tooth shape is round - Canine color is similar to a lateral
Timing of implants	<p>**MUST be after growth has stopped**</p> <ul style="list-style-type: none"> - Females: >17 - Males: > 21 <p>Confirm cessation of growth with serial ceph's</p>

Supernumerary

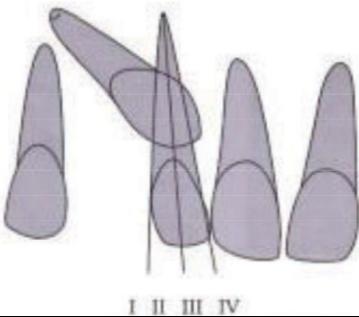
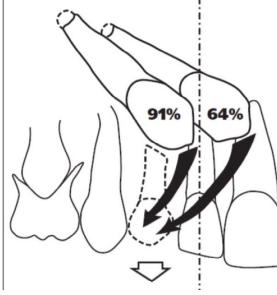
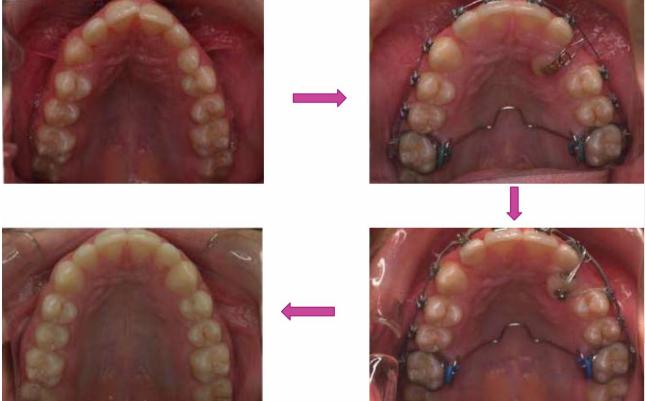
Definition	= Teeth in excess of the normal number
Distribution	Can be: <ul style="list-style-type: none"> - Single - Multiple - Bilateral - Unilateral
Direction of Development (Orientation)	<ul style="list-style-type: none"> - Normal - Inverted - Transverse
Morphology	<p><u>Conical</u></p> <ul style="list-style-type: none"> - Small peg-shaped tooth - Presents usually as Mesiodens (in the midline of the maxilla) <p><u>Tuberculate</u></p> <ul style="list-style-type: none"> - >1 cusp - Usually on the palatal aspect of central incisors <p><u>Supplemental</u></p> <ul style="list-style-type: none"> - Duplication of a tooth - Looks identical to the tooth that is already there - Usually involves lateral incisor (but also 3rd molars and premolars) <p><u>Odontoma</u></p> <ul style="list-style-type: none"> - Complex (no clear tooth morphology) - Compound (multiple tooth-like structures)
Location	<p>Mesiodens</p> <ul style="list-style-type: none"> - Most common supernumerary tooth -> Maxillary midline <p>Supernumerary lateral incisor</p> <p>Paramolar (Extra premolar)</p> <p>Distomolar (4th molar)</p>
Diagnosis	Found either during routine clinical exam or on a radiograph <ul style="list-style-type: none"> - Early Dx with appropriate intervention can prevent future issues

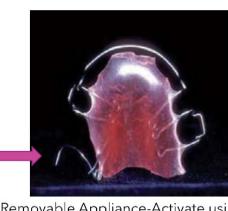
Mesiodens	
Management	Options largely depends on morphology and orientation: <ul style="list-style-type: none"> - Conical = 2x more likely to erupt vs tuberculate <ul style="list-style-type: none"> - If they are erupting in the right direction they are easier to exo as they erupt
	<p>Timing of Exo:</p> <ul style="list-style-type: none"> - 6-7 years - Delaying exo past 10 years causes ↑ developmental problems with the adjacent teeth <p>Complications with Exo:</p> <ul style="list-style-type: none"> - Most common is root resorption of the adjacent incisors

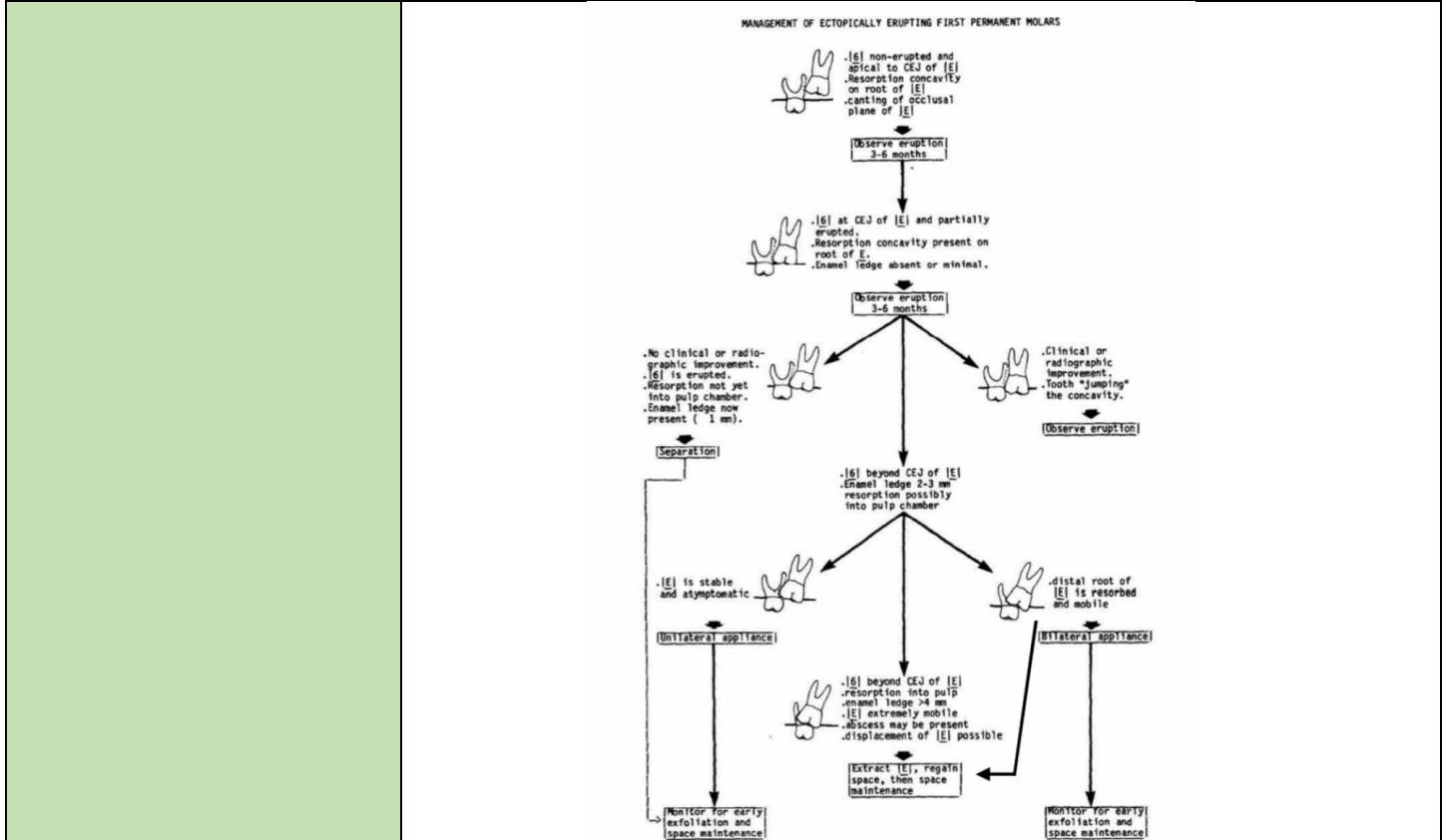
Transposition

Definition	= Positional interchange of 2 adjacent teeth (especially their roots), or the development or eruption of a tooth in a position occupied normally by a non-adjacent tooth
Most common Maxillary transpositions	<ol style="list-style-type: none"> 1. Canine-1st premolar (Mx. C.P1) 2. Canine – Lateral incisor (Mx C I2) 3. Canine- 1st molar (Mx. C. to M1) 4. Lateral incisor-central incisor (Mx. I2. I1) 

Ectopic Teeth

Definition	= Eruption of a tooth in the wrong place or along the wrong eruption path <ul style="list-style-type: none"> - Often leads to early loss of a 1^o tooth, and occasionally resorption of permanent teeth 	
Ectopic Canines		
Incidence	1-3% of population	
Distribution	<ul style="list-style-type: none"> - Females: Males = 2:1 - Maxilla 2x more likely than mandible - 1/3 labially; 2/3 palatally - 8% bilateral <p>*Labially erupting canines more associated with crowding*</p>	
Early Diagnosing	Hx and Clinical Exam <ul style="list-style-type: none"> - Palpate -> Buccal or Palatal bulge - Age 10-11 -> Check for 1^o canine mobility - Check asymmetric eruption - Family Hx - Females - Small or missing lateral incisors (Associated with peg laterals) 	Radiographic <ul style="list-style-type: none"> - Take a pan at 10-11 yrs - Periapicals (use SLOB to determine Palatal or Buccal) - CBCT (In severe situations)
Anomalies associated with Ectopic Canines	<ul style="list-style-type: none"> - Multiple missing teeth (Aplasia of upper laterals and premolars) - Peg shaped incisors - Ectopic Maxillary 1st molars - Infraocclusion of 1^o molars - Distal angulations of unerupted mandibular premolar 	
Classification	 <p>I II III IV</p>	Zone 1: Distal of the Lateral root Zone 2: Between D and middle of lateral Zone 3: Between Middle and M of lateral Zone 4: Mesial of the lateral root
Management	Options <ol style="list-style-type: none"> 1. <u>Interceptive/Early Tx</u> <ul style="list-style-type: none"> - Extraction of C -> 91% success if zone 1/2 , 64% success if zone 3/4 - Extraction of C+D - Cervical headgear (to create space) + Exo of C - RME 2. <u>Surgical Exposure + Ortho</u> 3. <u>No Tx + Monitor for pathological change</u> 4. <u>Extract + Prosthetic replacement</u> 5. <u>Extract + Space closure</u> 	 <p>-> Surgical Exposure + Ortho</p> 

Ectopic 1 st Molars	
Straight up Facts	Almost always Max. 1st molars <ul style="list-style-type: none"> - 66% "jump"/erupt into a normal position - 34% erupt ectopically in the arch -> causing premature loss of E's and space loss
Incidence	3-4% of population
Location	50% bilateral, 50% unilateral (usually in maxilla)
High Risk Groups	<ul style="list-style-type: none"> ↑ if sibling is affected (20%) ↑ in Cleft lip +/- Palate (20-30%) No gender predilection
Associated features	<ul style="list-style-type: none"> - Arch length deficiency (Crowding) - Retropositioned maxilla - Short maxilla - Steep angle of eruption of 1st permanent molar - Larger molar width
Management	<p>Reversible Ectopic</p> <p>IF: -Ledge on E <2mm -E is symptom free -E is firm and non-mobile</p> <p>THEN: 67% self correct Good prognosis of E after eruption of the ectopic molar -> Usually exfoliate normally - Monitor for 6 months</p> <p>Irreversible Ectopic</p> <p>Tx: <i>Distalize 6 with the E retained</i></p> <p>IF: -Ledge on E <2mm -E is symptom free -E is firm and non-mobile</p> <p>THEN: Ortho Separators (replace q2weeks) -> Should correct w/i 6-8 weeks - Monitor for early exfoliation of E and space maintenance</p> <p>IF: Ledge on E > 2mm (or separator unsuccessful) E is symptom Free E is firm</p> <p>THEN: Unilateral Appliance - Halterman appliance - Reverse band and loop w/ bonded occlusal button</p> <p>Bilateral Appliance - Monitor for early exfoliation of E and space maintenance</p>  <p>Halterman Appliance</p> <p>Tx: <i>No Treatment...results in:</i> - E Symptoms + Mobility - Space loss - 6 drifts mesially and rotates - 4 drifts distally - Midline discrepancy - 5 squeezed palatally - Canine crowding - 7 follows 6 (mesially)</p>  <p>Reverse band and loop</p> <p>Tx: <i>Space Regain + Maintain</i></p> <p>IF: E is mobile > 2mm, or is lost completely</p> <p>THEN: Space regain -> Fixed appliance or Removable appliance + Space maintain -> Nance Fixed appliance</p>  <p>Pendulum Appliance</p> <p>Tx: <i>Controlled Space closure</i></p> <p>IF: E mobile >2mm or is lost Congenitally missing 2nd premolar Class II crowding</p> <p>THEN: Controlled space closure</p>  <p>Removable Appliance-Activate using clasp</p>

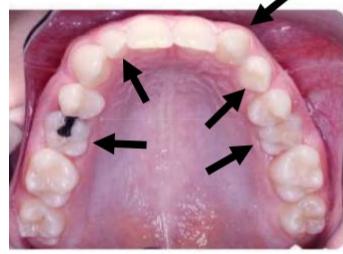
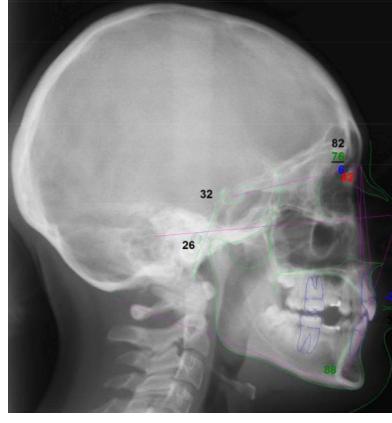


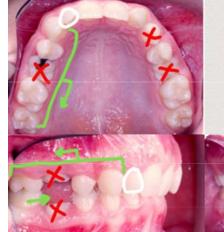
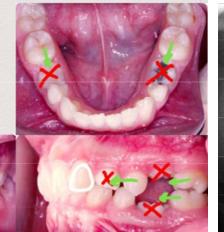
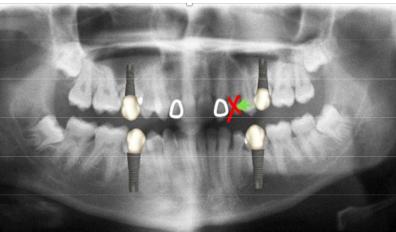
Ectopic 2nd Molar

Incidence	1.5%
Location	Mandible
Associated Features	<ul style="list-style-type: none"> - Previous LLHA - Sharp intermolar (6/7) angle
Management	<ol style="list-style-type: none"> 1. Surgical exposure of 2nd molar (Success rate of 70%) 2. Orthodontic uprighting 3. Extraction + 3rd molar substitution (Least successful)

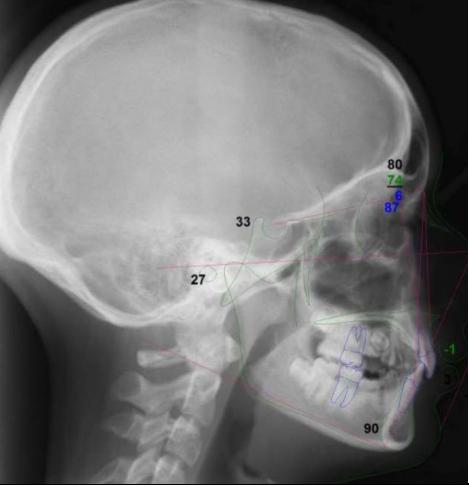
Tooth Anomaly OSCE

Case 1

Photo Composite	  <p>Chart# : 77880 DOB: 31/03/2002 Age: 15 28/09/2017</p>     <ul style="list-style-type: none"> - Convex Profile - Missing permanent Laterals - Retained E's - Deep OB
Panoramic Radiograph	 <ul style="list-style-type: none"> - Missing 5's - Retained E's
Lateral Ceph/ABO Tracing	 <p>SNA = Good (norm = 82 +/- 2) SNB = Low (Retrognathic Mandible) -> Norm = 81 +/- 2 ANB = High (Class II Skeletal) -> Norm = 1.6 +/- 2</p>

Diagnosis	<ul style="list-style-type: none"> - Skeletal Class II, with retrognathic mandible and slightly prognathic maxilla - Dental Class II w/ impinging bite (Deep OB) - Upper and lower midline to the right of facial midline - Retained and infra occluded Es - Congenitally missing permanent 5's - Missing 22, Peg shaped 12, Retained 63 - All 3rd molars are impacted (38 48 are mesioangularly impacted) - 2mm mandibular crowding; 3mm maxillary crowding
Prioritized Problems	<p>Congenitally missing permanent 5's and #22 Retained and Infraoccluded Es Retained 63 Impinging OB CL II Molar and Canine Deep Curve of Spee Retruded and severely retroclined maxillary incisors Mild maxillary and mandibular crowding</p>
Tx Options	<ol style="list-style-type: none"> 1. Extract + close all posterior space (Class I molar) <ul style="list-style-type: none"> - Implant at 22 - Build up 12 2. Extract + Close Maxillary posterior space, Restore lower spaces (Class II Molars) <ul style="list-style-type: none"> - Implant at 22 and lower 5's - Build up 12 3. Extract + Canine substitution + 4 implants (Class I R molar, Class II L Molar) <ul style="list-style-type: none"> - Canine sub. Quad 2 → reshape 23 to make a 22 + reshape 24 to make a 23 - Buildup 12 - Consolidate space in all 4 quads for implants in 5 spaces - Full FEA <div style="display: flex; justify-content: space-around; align-items: center;">    </div> <ol style="list-style-type: none"> 4. Extract and close all spaces (Class I Molar) <ul style="list-style-type: none"> - Implant at 22 - Mandibular advancement surgery - Build up 12
Tx Photos	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="flex: 1;">       </div> <div style="flex: 1; text-align: center;"> <p>Chart#: 77880 DOB: 31/03/2002 Age: 15 14/12/2017</p>     </div> <div style="flex: 1; text-align: center;"> <p>Chart#: 77880 DOB: 31/03/2002 Age: 15 08/03/2018</p>     </div> <div style="flex: 1; text-align: center;"> <p>Progress Chart#: 77880 DOB: 2002-03-31 Age: 17 2020-01-16</p>   </div> <div style="flex: 1;">    </div> </div>

Case 2

Photo Composite	 <p>Pre-treatment</p> <p>Chart #: 109508 DOB: 8/27/2001 Age: 13Y7M Date: 3/27/2015</p>
Panoramic	 <p>Ankylosed + Submerged 55, 75, 85 Congenitally missing 15, 35, 45 Impacted 23, retained 63 Impacted 25, retained 65</p>
Ceph	 <p>SNA = Good SNB = Low (Retrognathic mandible) SNA = High (Class II)</p>
Diagnosis	<ul style="list-style-type: none"> - Skeletal Class II due to retrognathic mandible - Dental Class I - Spacing in U and L arch - Ankylosed and submerged 55, 75, 85 (congenitally missing 15, 35, 45) - Impacted 23, retained 63 - Impacted 25, retained 65
Prioritized Problems	<ul style="list-style-type: none"> Submerged 55, 75, 85 and congenitally missing 15, 35, 45 Impacted 35 and 25 Deep impinging bite #22 peg lateral/Bolton discrepancy -> Mandibular excess Retrognathic mandible Moderate U and L spacing
Objectives	<p>Skeletal:</p> <ul style="list-style-type: none"> - Maintain all planes of space <p>Dental:</p> <ul style="list-style-type: none"> - AP: Maintain class I Molar and achieve Class I canine - Vertical: Achieve normal OB

	<ul style="list-style-type: none"> - Transverse: Maintain - Perimeter: Close U space and Close or hold L spaces to restore 35 and 45 - Extract all retained E's
Tx Plan	Extraction (Camouflage) <ul style="list-style-type: none"> - All E's - 63 - 25 - Surgical exposure of 23 - Close upper E space but hold lower E space for future implant resto of 35 and 45 - Build up 22
Progress Photos	<p>The grid contains 28 images arranged in a 7x4 pattern. The top row shows five external profile views of the patient. The middle section shows four rows of internal dental views (intraoperative) with specific charting information:</p> <ul style="list-style-type: none"> Row 2, center: Chart # : 109508 DOB: 8/27/2001 Age: 14Y6M Date: 3/21/2016 Row 3, center: Chart # : 109508 DOB: 27/08/2001 Age: 14Y9M Date: 20/06/2016 Row 4, center: Chart # : 109508 DOB: 27/08/2001 Age: 16 06/10/2017 Row 5, center: Chart # : 109508 DOB: 27/08/2001 Age: 16 16/04/2018

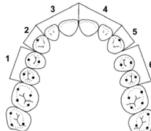
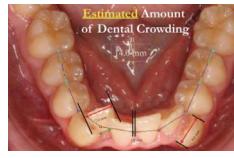
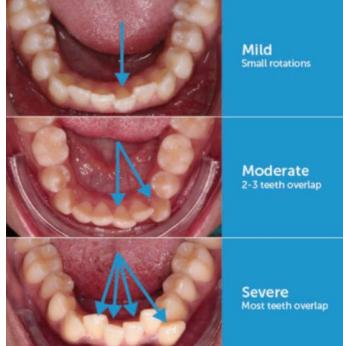
Questions:

1. What would you do if the teeth absent were actually present?
 - Non-extraction Tx Plan
2. Can this malocclusion be satisfactorily treated with extractions?
 - No
3. What is the likelihood of survival of deciduous molars?
 - Poor prognosis

Permanent Dentition: Crowding and Spacing

Crowding

Incidence	Moderate Incisor irregularity (4-6mm) -> 33% of the population Severe-Extreme incisor irregularity (7+mm) -> 15% of the population
Etiology	<p>Primary Crowding:</p> <ul style="list-style-type: none"> - Tooth Size-Arch Length Discrepancy (TSALD) - Measure: (Space Available) – (Space Required) -> if –ve value = crowding ; if +ve = Spacing - Measure "Eye-Ball": Sum up the discrepancies <p>Secondary Crowding:</p> <ul style="list-style-type: none"> - Space Loss (early loss of primary teeth) <p>Tertiary Crowding:</p> <ul style="list-style-type: none"> - Late Mandibular growth <p>**Lower incisor crowding is not associated with eruption of wisdom teeth**</p>

Measurements	<p>(Space Available) – (Space Required):</p> <ul style="list-style-type: none"> - If -ve value = Crowding - If +ve = Spacing <p>Eye-Ball Method:</p> <ul style="list-style-type: none"> - Sum up the overlap btwn contacts   <p>**Space analysis is different if mixed dentition** -> Cannot eyeball it</p> <ul style="list-style-type: none"> - Predict size of permanent 3, 4, 5 based on lower incisors <ul style="list-style-type: none"> - Tanaka Johnson - Moyers
Classification	<p>Mild: <4mm</p> <ul style="list-style-type: none"> - Usually non-exo Tx <p>Moderate: 4-7mm</p> <ul style="list-style-type: none"> - Borderline (Exo or non-exo) <p>Severe: 7mm+</p> <ul style="list-style-type: none"> - Usually needs Exo 
Treatments for Crowding	
<p>S – Stripping / Interproximal Reduction (IPR)</p> <p>P - Proclination</p> <p>E – Extraction (Moderate to Severe Crowding)</p> <p>E – Expansion (Don't always need to expand, must look at L3-3)</p> <p>D- Distalization</p>	
Interproximal Reduction (IPR) (Stripping)	<p>What is it?</p> <ul style="list-style-type: none"> - Reduction of enamel (Maximum 0.5mm/contact, 0.25mm/tooth) <p>Indications</p> <ul style="list-style-type: none"> - Esthetics (Black Triangles) -> >5mm between contact point and the crest of alveolar crest = Black triangles - Mild-Moderate TSALD - Bolton discrepancy (Mandibular Excess/Maxillary deficiency) - Concept of improved lower incisor stability (not sure what this means tbh) <p>Tools of the Trade:</p> <p>Disks:</p>  <p>Strips:</p> 
Proclination	<p>What is it:</p> <ul style="list-style-type: none"> - Labial tipping/flaring of teeth <p>Rule of Thumb:</p> <ul style="list-style-type: none"> - NOT 1:1 ratio -> for every 2.5° of Proclination = 1mm of arch length gain - ^ Opposite if you retrocline/upright teeth
Extraction <ul style="list-style-type: none"> - Multifactorial decision 	<p>Factors to consider (Exam list):</p> <ul style="list-style-type: none"> - Facial profile (Protrusiveness? Lip Support?) - Growth Pattern (hyper vs hypodivergent, Skeletal I, II, III?) - Amount of Crowding - Location of Crowding - Lower incisor inclination (usually 90-95°) - Gingival/Perio Health - Compromised teeth (caries, RCT, den invaginatus/evaginatus) - Midlines (Asymmetric exo's for subdivision cases)

Borderline Cases (Moderate Crowding):

- Non-Exo Tx -> Results in more protrusive teeth (~2mm)
- Exo Tx -> Results in a "flatter" profile, ↓ convexity

Common Exo Patterns:

- Class I -> U/L 4's or U/L 5's
- Class II -> U4/L5
- Class III -> U5/L4

Esthetic Considerations:

High Angle Vs Low Angle Mandibular Plane



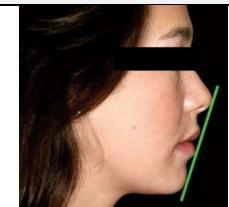
- MP line is **above the Occiput** = Doliccephalic + Open Bite
- MP Line **below the Occiput** = Deep Bite

Ricket's E Plane

= Line from Soft tissue chin (Pogonion) to the tip of the nose

Position of the lips is usually age dependent: -> Chin and Nose continue to grow with age!

- Young = U/L lips protrusive to E Plane
- Teens = U/L Lips on the E Plane
- Adults = U/L Lips retrusive to E plane



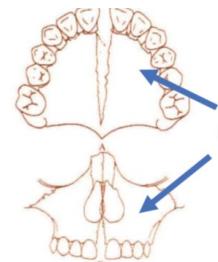
Expansion

Indications:

- Unilateral Xbite
- Bilateral Xbite
- Relative AP discrepancy
- Dental compensation (Accentuated curve of wilson: Uppers flared buccally, Lowers rolled in lingually)
- Cleft Patients
- Class III (From maxillary hypoplasia)
- Need ↑ arch length (Mild-Moderate Maxillary Crowding)

Dental vs Skeletal

- Dental: Arch Width Expansion -> Tip the teeth labially
- Skeletal: Slow Max Expansion or Rapid Max Expansion
 - Need to know age of the patient (Status of the suture)
 - Early expansion = ↑ Skeletal Effect and ↓ Dental tipping effect



Pattern:

- Pyramidal Expansion -> Most expansion occurs anteriorly and Interiorly

Rule of Thumb:

- Maxillary: 1mm Transverse expansion = 0.7mm ↑ arch length
- Mandibular: 1mm transverse expansion = 0.3mm ↑ arch length
- Over expand: Expand 30% more than you need (Palatal cusps of Max contact buccal cusps of mand) -> Expect the relapse
- NEVER expand mandibular 3-3 sextant -> Unstable and ↑ relapse

Timing:

- RME before pubertal spurt = ↑ effects of skeletal expansion
- <10 yrs: SME (1 turn q2-3 days)
- > 10 yrs: RME (1-2 turn/day)
- Adults: Need Surgically Assisted Rapid Palatal Expansion (SARPE) or 2 piece LeFort 1



Distalization	<p>= Moving teeth distally within the arch</p> <p>Rule of Thumb:</p> <ul style="list-style-type: none"> - Usually max needed is <1/2 cusp (3mm) of Distalization <p>Appliances:</p> <ul style="list-style-type: none"> - Distal Jet/Pendulum Appliance - Clear Aligner molar distalization - Headgear  <div style="display: flex; justify-content: space-around; margin-top: 10px;"> Class II subdivision Left B/c early loss of E Unilateral activation </div>
Extraction notes	<p><u>Esthetic Effects</u></p> <ul style="list-style-type: none"> - Potentially damaging for Pre-Tx retrusive faces - Can improve protrusive profiles <p><u>Effects on Buccal corridors</u></p> <ul style="list-style-type: none"> - Exo DOESN'T ↑ buccal corridors...I don't care what the media says <p><u>Effects on TMD</u></p> <ul style="list-style-type: none"> - No evidence of ↑ TMD with exo <p><u>Effects on OSA</u></p> <ul style="list-style-type: none"> - No evidence that Exo causes OSA

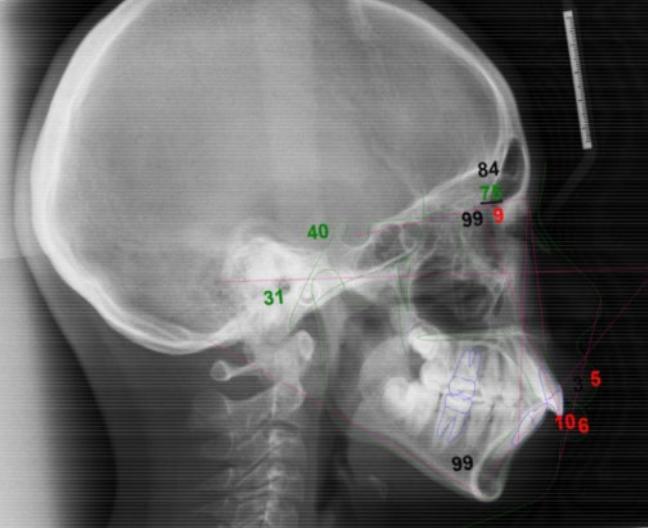
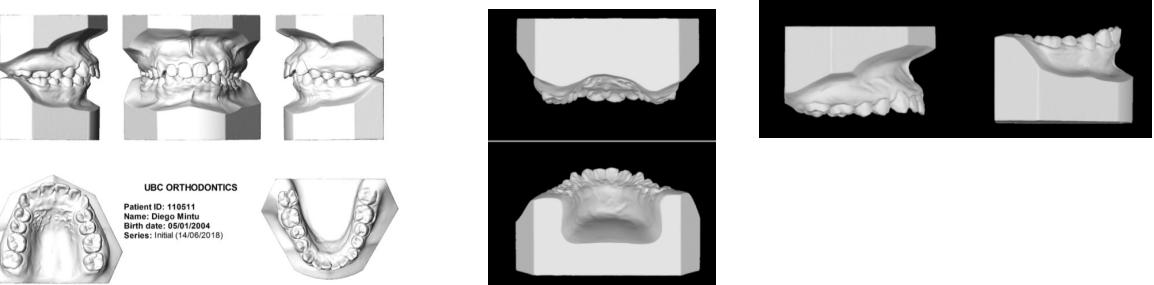
Normal Changes with Age

- Arch Length ↓
- Arch Width ↓
- Intercanine (3-3) Width ↓
- Overbite ↑
- Crowding ↑

Spacing

Incidence	<p>High incidence</p> <ul style="list-style-type: none"> - 51.8% in males - 45.5% in females - Both Arches > Maxillary arch > Mandibular arch
Etiology	<ul style="list-style-type: none"> - Congenitally missing teeth (8s > L5 > U2) - Missing Teeth (Previously Exo etc -> teeth and midlines drift) - Hypoplastic Teeth (Peg laterals) - Frenum attachment (Causes diastema) - Oral Habits (Thumb Sucking -> Protrudes teeth -> Spaces) - ↓ Perio Support - Protrusion or Proclination of teeth
Bolton Analysis	<p>= $(\text{Sum of M-D width of mandibular}) / (\text{Sum of M-D widths of Maxillary}) \times 100\%$</p> <p>Norms:</p> <ul style="list-style-type: none"> - Anterior (3-3) -> 77.2% - Overall (6-6) -> 91.3% <p>Quick Version:</p> <ul style="list-style-type: none"> - Compare U2 vs L2 -> If they are the same size (M-D) then there is probably a Bolton discrepancy

Clinical Exam

Pt Presentation	<p>Age. 14yrs 8months - Permanent Dentition CC: "My dad says I need Braces MHx: No allergies, conditions or meds OHE: Fair (WSL 14, 15, 16, 21, 25, 26, 36, 46) Restos: Fissure Sealants on 6s Perio: Generalized Mild gingivitis</p>																																																																																																																																																																																																																																																															
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Skeletal (Pg-Na Perp) (mm)</td> <td>-12.3</td> <td>4.0</td> <td>5.3</td> <td>-1.6 *</td> </tr> <tr> <td>Mandibular length (Co-Gn) (mm)</td> <td>101.3</td> <td>121.1</td> <td>4.0</td> <td>-4.9 ****</td> </tr> <tr> <td>Maxilla to Mandible Skeletal</td> <td>8.8</td> <td>1.6</td> <td>1.5</td> <td>4.8 ****</td> </tr> <tr> <td>ANB (*)</td> <td>8.8</td> <td>1.6</td> <td>1.5</td> <td>4.8 ****</td> </tr> <tr> <td>Mx/Mn diff (Co-Gn - Co-A) (mm)</td> <td>18.3</td> <td>24.4</td> <td>4.0</td> <td>-1.5 *</td> </tr> <tr> <td>Wits Appraisal (mm)</td> <td>4.6</td> <td>-1.0</td> <td>1.0</td> <td>5.6 *****</td> </tr> <tr> <td>Convexity (Na-AFc) (*)</td> <td>24.6</td> <td>5.4</td> <td>3.0</td> <td>6.4 *****</td> </tr> <tr> <td>Maxilla Dentoalveolar</td> <td>88.8</td> <td>102.7</td> <td>5.5</td> <td>-0.7</td> </tr> <tr> <td>UI - SN (*)</td> <td>109.9</td> <td>111.0</td> <td>6.0</td> <td>-0.2</td> </tr> <tr> <td>UI - MP (*)</td> <td>111.9</td> <td>110.0</td> <td>5.0</td> <td>0.4</td> </tr> <tr> <td>UI - Palatal Plane (*)</td> <td>15.1</td> <td>22.8</td> <td>5.7</td> <td>-1.4 *</td> </tr> <tr> <td>UI - NB (*)</td> <td>3.1</td> <td>4.3</td> <td>2.7</td> <td>-0.4</td> </tr> <tr> <td>UI-Incisor Protrusion (UI-APo) (mm)</td> <td>12.9</td> <td>6.0</td> <td>2.2</td> <td>3.2 ***</td> </tr> <tr> <td>Mandible Dentoalveolar</td> <td>99.8</td> <td>95.0</td> <td>7.0</td> <td>0.7</td> </tr> <tr> <td>IMPA (L1-MP) (*)</td> <td>36.9</td> <td>25.9</td> <td>6.1</td> <td>1.9 *</td> </tr> <tr> <td>LL - NB (*)</td> <td>5.6</td> <td>4.0</td> <td>1.8</td> <td>3.1 ***</td> </tr> <tr> <td>LL Protrusion (L1-APo) (mm)</td> <td>5.9</td> <td>2.7</td> <td>1.7</td> <td>1.9 *</td> </tr> <tr> <td>Vertical Dimension</td> <td>31.1</td> <td>24.1</td> <td>4.5</td> <td>1.6 *</td> </tr> <tr> <td>PNS (Mn-NgN) (*)</td> <td>39.5</td> <td>32.9</td> <td>5.2</td> <td>1.3 *</td> </tr> <tr> <td>SN - GoGn (*)</td> <td>47.0</td> <td>45.0</td> <td>3.0</td> <td>0.7</td> </tr> <tr> <td>UFH/TFH (N-ANS:N-Me) (%)</td> <td>53.0</td> <td>55.0</td> <td>3.0</td> <td>-0.7</td> </tr> <tr> <td>LFH/TFH (ANS-Me:N-Me) (%)</td> <td>57.7</td> <td>65.0</td> <td>4.0</td> <td>-1.8 *</td> </tr> <tr> <td>P-A Angle (S-Gn/N-Me) (%)</td> <td>21.4</td> <td>20.0</td> <td>3.0</td> <td>-1.4 *</td> </tr> <tr> <td>U6 - PB (UPercentile) (%)</td> <td>40.3</td> <td>44.0</td> <td>3.0</td> <td>-1.2 *</td> </tr> <tr> <td>LL - MP (LADH) (mm)</td> <td>28.3</td> <td>34.0</td> <td>3.0</td> <td>-1.9 *</td> </tr> <tr> <td>Soft Tissue</td> <td>4.6</td> <td>-5.6</td> <td>2.0</td> <td>5.1 *****</td> </tr> <tr> <td>Upper Lip to E-Plane (mm)</td> <td>5.8</td> <td>-2.0</td> <td>2.0</td> <td>3.9 ***</td> </tr> <tr> <td>Lower Lip to E-Plane (mm)</td> <td>111.1</td> <td>102.0</td> <td>8.0</td> <td>1.1 *</td> </tr> <tr> <td>Nasolabial Angle (Col-Sn-UL) (*)</td> <td>20.0</td> <td>12.0</td> <td>2.0</td> <td>4.0 ***</td> </tr> <tr> <td>Facial Convexity (G'-Sn-Po') (*)</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>  <p>UBC ORTHODONTICS Patient #: 11051 Name: Dinesh Birth date: 05/01/2004 Series: Initial (14/06/2018)</p>		Mean	SD	Range	Significance	Maxilla to Cranial Base	83.7	82.0	3.5	0.5	SNB (*)	74.9	80.9	3.4	-1.8 *	SN - MP (*)	39.9	32.9	5.2	1.3 *	FMA (MP-FH) (*)	31.5	24.1	4.5	1.7 *	Maxillo-Mandibular	8.8	1.6	1.5	4.8 ****	ANB (*)	8.8	1.6	1.5	4.8 ****	Maxillary Dentition	3.1	4.3	2.7	-0.4	UI - SN (*)	98.8	102.7	5.5	-0.7	Mandibular Dentition	9.6	4.0	1.8	3.1 ***	LL - NB (mm)	99.4	95.0	7.0	0.6	LL - MP (*)	99.4	95.0	7.0	0.6	Soft Tissue	5.8	-2.0	2.0	3.9 ***	Lower Lip to E-Plane (mm)	5.8	-2.0	2.0	3.9 ***	Upper Lip to E-Plane (mm)	4.6	-5.6	2.0	5.1 *****	Maxilla Skeletal	83.7	82.0	3.5	0.5	SNA (*)	83.7	82.0	3.5	0.5	Maxillary Skeletal (A-Na Perp) (mm)	4.7	0.0	3.1	1.5 *	Midface Length (Co-A) (mm)	83.0	92.6	4.0	-2.4 **	Mandible Skeletal	74.9	80.9	3.4	-1.8 *	SNB (*)	74.9	80.9	3.4	-1.8 *	Mand. 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Analysis	
Facial Diagnosis	<p>Profile: Convex (Retrognathic mandible w/ retrusive chin button)</p> <p>Relationship to E-Line (Ricketts): Protrusive Lips</p> <p>Lip Competence: Not competent <ul style="list-style-type: none"> - Mentalis muscle strain to close lips </p> <p>Nasolabial Angle: Acute <ul style="list-style-type: none"> - Nose will grow with age -> Making this angle more acute with time </p> <p>Vertical Growth: Hyperdivergent <ul style="list-style-type: none"> - High MP angle -> MP traces above the Occiput on ceph </p> <p>Crowding Prognosis if untreated: Will get worse or stay the same <ul style="list-style-type: none"> - Arch length ↓ over time </p>
Dental Diagnosis	<p>Molar/Canine Relationship: Molar Class II Div 1 (1/2 cusp R, Full cusp L) ; Canine Class II</p> <p>OJ: 5mm</p> <p>OB: 60% <ul style="list-style-type: none"> - Deep OB from deep CoS + Over eruption of UI's </p> <p>Crowding: Max – 5mm (Moderate) ; Mand – 2mm (Mild)</p> <p>Midlines: Coincident interarch and with the facial midline</p> <p>Crossbites: L Posterior Xbite (16/46)</p> <p>Periodontal Biotype: Thin, Accentuated CoS, proclined LI @99°</p> <p>Arch Form: Max – Square; Mand = Ovoid</p> <p>Bolton Discrepancy: There is none 😊 <ul style="list-style-type: none"> - U2 and L2 are not the same size...this is a good thing) </p>
Smile Esthetics	<p>Consonant Smile Arc?: No, incisal edges of UI's do not follow the curve of the lower lip</p> <p>Gingival Heights: Not ideal (Ideal = High-Low-High, 3, 2, 1) <ul style="list-style-type: none"> - Gingival height of 3's should be the same as 1's and laterals should be lower </p> <p>Buccal Corridors: Wide</p>
Cephalometrics	<p>Skeletal Pattern of Maxilla (SNA): Orthognathic</p> <p>Skeletal Pattern of Mandible (SNB): Retrognathic</p> <p>Skeletal Max:Mand relationship (ANB): Class II</p> <p>Vertical Skeletal Pattern (MP Angle): Hyperdivergent</p> <p>Position (U1-NA) and Inclination (U1-SN) of UI's: Both Normal</p> <p>Position (L1-NB) and Inclination (L1-MP) of LI's: Protrusive <ul style="list-style-type: none"> - When we have high MP angle we want to LI's to be more retrusive (Can be protrusive if the MP angle is low) </p>

Problem List	
Skeletal	<p>A-P: <ul style="list-style-type: none"> - Class II w/ orthognathic maxilla and retrognathic mandible - Still in growth spurt </p> <p>Transverse: <ul style="list-style-type: none"> - Normal </p> <p>Vertical: <ul style="list-style-type: none"> - Hyperdivergent growth pattern </p>
Dental	<p>A-P: <ul style="list-style-type: none"> - Class II Div 1 (1/2 cusp R, full cusp L) </p> <p>Transverse: <ul style="list-style-type: none"> - Dental Crossbite 16/46 </p> <p>Vertical: <ul style="list-style-type: none"> - Deep Bite </p> <p>Perimeter: <ul style="list-style-type: none"> - 4-5mm crowding Max - 2mm Crowding Mand - No Bolton Discrepancy </p>
Facial	<p>Naso-labial Angle <ul style="list-style-type: none"> - 90° </p> <p>Lips to E-line: <ul style="list-style-type: none"> - Protrusive - Mentalis strain </p> <p>Vertical and Horizontal Proportions: <ul style="list-style-type: none"> - Even </p> <p>Asymmetry: <ul style="list-style-type: none"> - None </p>

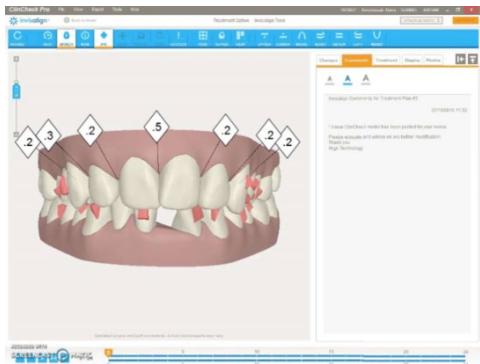
Tx Plan:

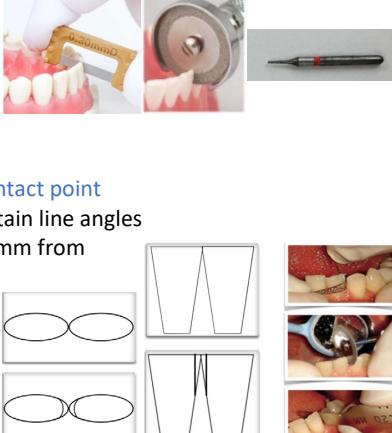
Exo	Non-Exo
<p>Extraction is the best choice</p> <ul style="list-style-type: none"> ○ Helps protrusive lip profile ○ Shallows the deep CoS ○ Evens out the Hyperdivergent growth ○ Lower Incisors are proclined with thin gingival biotype <p>Extraction Pattern: - Class II -> U4/L5</p>	<p>Non-Extraction is a bad idea:</p> <ul style="list-style-type: none"> ○ Causes more Proclination and protrusion of LI's ○ Would worsen the lip competency and protrusion
Complete Tx Plan	Exo U4/L5 U/L FEA Nance or High position Headgear or Fixed Class II Corrector w/ intrusive vector - HPHG limits maxillary vertical and horizontal growth -> Intrudes and distalizes the upper Molars to help Class II and Hyperdivergence

Pros and Cons of Invisalign (Clear Aligners)

The Process

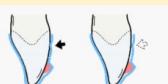
1. Orthodontic Records
2. Diagnosis and Tx Planning
3. ClinCheck Setup & Mods
4. Deliver the Aligners
5. Monitor the Tx
6. Finish the Case
7. Retention

Orthodontic Records	<ul style="list-style-type: none"> - Photos (Extra + Intraoral) - Panoramic Radiograph (Assess development, screen for impactions, missing/supernumerary teeth etc) - Cephalometric Rads - Study Models (Digital or plaster)
Diagnosis and Tx Plan <ul style="list-style-type: none"> - Most important step 	<p>Transverse:</p> <ul style="list-style-type: none"> - Crossbite? - Is Expansion needed? - Is there recession? <p>Antero-Posterior:</p> <ul style="list-style-type: none"> - Class I/II/III - Skeletal or Dental? <p>Vertical:</p> <ul style="list-style-type: none"> - Deep OB or Open bite? <p>Crowding:</p> <ul style="list-style-type: none"> - Do we need Expansion/Proclination/IPR/Exo? <p>Malpositions</p>
ClinCheck Setup and Modification	<p>= This is the program that gives the 3D representation of the tooth movement</p> <ul style="list-style-type: none"> - Clinician communicates with the lab tech in Costa Rica via the program to make any changes - As the Dr. we need to review the ClinCheck and modify/improve if needed. Are these movements reliable and safe? <p>Review Checklist:</p> <ul style="list-style-type: none"> ○ Final positions of teeth in the finished occlusion ○ Staging of tooth movements ○ Difficulty of tooth movement ○ Attachments ○ Interproximal reduction (IPR) ○ Precision cuts for inter-arch elastics ○ Over-correction 

	<p>Attachments</p> <p>= Bonding composite on the target teeth using an attachment template</p> <ol style="list-style-type: none"> 1. Fill the bubbles in the template with composite 2. Etch Prime Bond the tooth 3. Place Template on 4. Light Cure 5. Peel off the template <p>Purpose:</p>  <ul style="list-style-type: none"> - ↑ Retentiveness of the aligner (Helpful for short clinical crowns and non-retentive tooth shape) - Help tooth movement (Rotations, Intrusion, Extrusion, M-D root angulations) - Allows us to bodily move teeth! Traditionally removables can only tip teeth <p>Interproximal Reduction</p> <p>= Removal of interproximal enamel to provide space for tooth movement (Relieve crowding or fix Bolton discrepancy)</p> <ul style="list-style-type: none"> - Also reshapes teeth to improve contact points and minimize Black Triangles <p>Tools:</p> <ul style="list-style-type: none"> - Diamond sandpaper strips (Slow) - Slow speed disks (Fast, but need more technique) - High speed diamond burs (Mosquito Bur) <p>Tips:</p> <ul style="list-style-type: none"> - Choose teeth with triangular shapes and a narrow contact point - Preserve the morphology -> Round the corners, maintain line angles - Remove ONLY enamel (0.5mm max per contact; 0.25mm from each tooth) -> no LA is needed - Follow stages -> Different sites will need IPR at different times 
Deliver the Aligners	<p>Instructions for Wear</p> <ol style="list-style-type: none"> 1. Wear for 22hrs/day -> Only remove them to eat 2. Wear each set for 1 week, then move onto the next set <ul style="list-style-type: none"> - Do not throw away aligners when you move onto the next step -> We may need to go back <p>*Instruct on how to insert and remove them *Instruct how to clean aligners</p> <p>Expectations:</p> <ul style="list-style-type: none"> - Discomfort -> Takes time to get used to the feel and tooth tenderness - Changes in speech - ↑ Salivation - Show the tooth movements in ClinCheck to ↑ compliance -> Pt can see the end result for motivation & Esthetic approval
Monitor Treatment	<p>Check:</p> <ul style="list-style-type: none"> - Compliance - Fit of current retainer - Condition and engagement of the attachments - Evaluate tight contact -> Do they need IPR? - Ensure tooth movement is tracking the ClinCheck simulation - Ensure Occlusion is being maintained

Finishing the Case	<p>Detailling:</p> <ul style="list-style-type: none"> - Use detailing pliers to make specific pressure points on the aligners -> Nudge the teeth into positions built into the aligner <p>Additional Aligners (Refinement) needed it:</p> <ul style="list-style-type: none"> - Open contacts were formed - To Improve occlusal contacts - Tooth movements not fully expressed in the OG aligners - Fine-tuning requested by the patient <p>Over-Correction:</p> <ul style="list-style-type: none"> - State the amount of over-correction you want from the beginning -> "Over-Correct rotation by 5 degrees" <p>Virtual C-Chain Aligners:</p> <ul style="list-style-type: none"> - These may be requested at the end if open contacts persist - Usually 3 stages at the end of treatment -> Extra aligners - Wear these until floss "Clicks" through the contact area - Caution! May cause crowding to re-occur if worn too long
Retention	<p>Options:</p> <ul style="list-style-type: none"> - Hawley retainers (Acrylic + Wire) - Clear Vacuum formed retainers (Essix) - Vivera Retainers (Similar to the Invisalign -> Thicker and stiffer) - Fixed: Bonded lingual wire 

Fixed Vs Clear Aligners

	Fixed Braces	Clear Aligners
Force	<p>"Pull" on teeth</p> 	<p>"Push" on teeth</p> 
Engagement	<p>Archwire into bracket slots</p> <ul style="list-style-type: none"> - Thicker the wire = better engagement 	<p>More plastic wrapped around teeth = better engagement</p>
Anchorage	<p>Reciprocal anchorage</p> <ul style="list-style-type: none"> - Newton's 3rd law 	<p>Segments may be pre-determined</p>
Incisor Inclination	<p>Incisors Procline w/ Crowding alleviation and Retrocline with space closure</p>	<p>Able to control the inclination very well</p>
Vertical Control	<p>OB and OJ ↓ w/ Proclination and alignment</p>	<p>Able to control the vertical dimension very well in minimal OB/OJ cases</p>
Midline Correction	<p>Dependent on elastic wear</p>	<p>Predictable with appropriately planned IPR</p>
Tooth Size discrepancy (Bolton)	<p>Needs to be calculated/adjusted midway through Tx</p>	<p>Can be accurately calculated in ClinCheck before you begin</p>

Invisalign		
Pros	<p>For the Patient:</p> <ul style="list-style-type: none"> - Better Esthetics - Removable - Easier oral hygiene - Gentle forces - More comfortable - ↓ Chair time - Fewer Appointments - Fewer Emergencies 	<p>For the Doctor:</p> <ul style="list-style-type: none"> - Less white spot lesions - Low, constant forces - Digital planning tools make planning easier - ↓ chair time - Fewer appointments - Fewer emergencies - Can isolate tooth movements and control reciprocal movements easier for anchorage - Sequential Distalization is possible -> Very hard to do with fixed - Better control of incisor inclinations -> Limits Proclination - Can design the final occlusion from the beginning
Cons	<ul style="list-style-type: none"> - Requires very good pt compliance - Not as efficient for some movements (Rotations, root mis-angulations) -> Needs Auxillary Tx (Segmental brackets or buttons) - Additional Aligners at the end are frequently needed 	

Cases Needing Auxiliary Treatments

Severe Rotations	Rotations > 30° are hard for Invisalign alone - Add power chains and buttons before Invisalign to rotate teeth	
Bilateral Crossbite		
Single Tooth Extrusion	Place a boot-stap elastic over the aligner with buttons to hook the elastic over	
Molar Uprighting	Segmental brackets can be used to upright molars	
Root Movements	 Brackets can be used to change the angulation of the roots to be more parallel	

Case Selection:

Easy Cases (Start here)	- Class I or Mild Class II - Mild-Moderate spacing/Crowding - Idea-moderate OB (<50% OB is manageable) - Limited Tx Objectives - Diastema closure - Anterior crossbite -> the 2 layers of plastic helps to jump the bite!
Moderate Difficulty (After 16-50 easy cases)	- Difficult rotations (> 30°) - Needing IPR > 6mm total - Distalization required, or elastic wear
Advanced Cases (> 50 case experience)	- Lower incisor extraction - Premolar Extraction - Buccal Crossbites - Orthognathic surgery

