

An Outline and Review of Guidance Procedures in MANAGEMENT OF THE DEVELOPING OCCLUSION

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I. CLINICAL EVALUATION OF THE PRIMARY DENTITION

- Primary teeth erupt on average from 8 months (Lower central incisors) to 30 months (Upper second primary molars) of age with a S.D. of 3 months. Sequence in both arches as follows: A – B – D – C – E
- Primary dentition occlusal relationships established by 36 months of age with minimal subsequent dimensional changes (length, width, perimeter) occurring until permanent dentition eruption.
- Spaced vs. non-spaced arches: Approximately 2/3rds of primary dentitions exhibit generalized spacing (Baume Type I) while 1/3rd are non-spaced (Baume Type II). Primate spaces mesial to upper primary canines and distal to lower primary canines commonly occur in both Baume type archforms.
 - Once established, arches remain spaced or non-spaced over course of primary dentition.
 - Spaced vs. non-spaced arches related to basal arch size rather than tooth mass differences.
 - Primary spacing affects crowding outcome predictors into the mixed dentition:
 - spacing 3 to 6 mm. > no transitional crowding
 - spacing less than 3mm. > 20% with incisor crowding
 - no spacing > 50% with incisor crowding
 - crowded primary teeth > 100% with incisor crowding
- Molar Terminal Plane Relationships
 - Mesial step (approximately 15% incidence) - usually results in Cl. I permanent molar relationship.
 - Flush terminal plane (approximately 75% incidence) – majority “shift” to Cl. I permanent molar relationship; but significant number stay end-on or “shift “ to full Class II permanent molars..
 - Distal step—usually results in full Class II, some shift to end-on Class II molars.
- Canine Relationships: Best predictor of sagittal relationship into the permanent dentition.
 - Mesial step canines - usually results in Class I relationship
 - Distal step / End-on canines - usually results in Class II to end-on permanent dentition
 - Excessive mesial step (with incisor crossbite) - usually results in Class III permanent dentition
- Incisor Relationships
 - Overbite: 2 mm. (30 to 50% vertical overlap) - Overjet: 0–3 mm.
- “Ideal” Primary Dentition Occlusion
 - Flush terminal plane or mesial step molar with Class I canines
 - Generalized spacing including primate spaces - 2 mm. overjet & 2 mm. overbite (30%)

II. MANAGEMENT OF THE PRIMARY DENTITION OCCLUSION

Premature Loss of Primary Teeth - Space Maintenance in the Primary Dentition

- Primary Incisors: Space loss unlikely if primary canines erupted into occlusion. Replacement of primary incisors (e.g. “Hollywood” bridge) is elective for cosmetic issues, not space control.
- Primary Canines: Usually due to ectopic eruption of permanent laterals as sign of overall space deficiency - beyond simple space maintenance. If loss of canine secondary to caries or trauma, no space maintenance generally indicated except to maintain midline symmetry.

- First primary molars: Space maintenance indicated if first permanent molars are in active eruption.
 - Usually unilateral fixed appliances from second primary molars to primary canines are recommended (e.g. crown or band and loop / arm).
 - Once first permanent molars erupt into occlusion, space loss negligible if first primary molars lost during mixed dentition and second primary molars remain to buttress first molar position.
- Second primary molars: Regardless of timing, space maintenance generally indicated as space loss occurs in primary or mixed dentition. Space loss greater in upper arch as maxillary first molars move forward bodily & rotate around palatal root - tipping not a major factor. Lower molars evidence mesial & lingual crown tipping, less notable bodily movement. Space loss in either arch most dramatic in timing association with eruption of first permanent molars.
 - If 6-year molar not erupted or in active eruption, distal shoe from first primary molar to guide first molar eruptive positioning is generally appliance of choice.
 - Once 6-year molars erupted, bilateral space maintainers advised to replace distal shoe and control molars and allow buccal transition due to eruption patterns, potential loss of abutments.
 - Mandibular arch: Lingual holding arch once lower incisors erupted.
 - Maxillary arch: Transpalatal arch or Nance appliance.

Posterior Crossbites in the Primary Dentition

- Functional Posterior Crossbite: Lateral shift of mandible on closure results in appearance of unilateral crossbites in maximum intercuspation. Greater than 90% X-bites in children express a functional shift.
 - Crossbite involves entire buccal segment (90+ % C-D-E segment, 2/3rds include primary lateral in pattern), lower midline approximates 2 mm. discrepancy toward crossbite side on average.
 - Shift of condyles on closure: crossbite side rotates around condylar axis and non-crossbite side projects down and forward. Result is asymmetric chin positioning and Class II subdivision molar positioning (crossbite side Class II / distal step, non-crossbite side Class I to III / mesial step).
 - Constricted maxillary intercanine width probable factor as first contact position exhibits transverse end-on buccal cusp-to-cusp occlusion. May be associated with vertically oriented primary canine interferences, digit habit or mouthbreathing patterns.
 - Associated with asymmetric growth patterns as crossbite side exhibits shorter mandibular length and Class II relationships when untreated or when treatment delayed late in growth years.
 - TMD issues suggested when lateral mandibular shifts expressed in the permanent dentition.
 - Maxillary expansion: Basic treatment to correct transverse discrepancy and eliminate functional shift. Appliances reported with success treatment rates include:
 - Fixed rapid palatal expanders using high force (RPE of Hass, Hyrax) - over 90% success.
 - Fixed palatal wire expanders using "slow, low-force" (w-arch, quad helix) - over 90% success.
 - Removable Schwartz Plate-type appliances – approximately 70% success.
- Bilateral Posterior Crossbite: Represent true maxillary skeletal constriction with bilateral buccal segment crossbite, midline symmetry, and no notable shift of mandible.
 - Reported at 2 to 3% of posterior crossbites in children, often associated with dolichofacial skeletal growth, openbite malocclusion, compromised airways, and mouthbreathing patterns.
 - Maxillary expansion with emphasis toward sutural separation indicated for significant transverse discrepancy (e.g. fixed palatal expanders - RPE of Hass, Hyrax).
 - Given etiological factors with skeletal growth and airway issues, while early expansion is desirable; long-term management generally requires a multiphased orthodontic treatment plan.

Anterior Crossbites in the Primary Dentition

- Anterior crossbites typically involve full incisor segment as opposed to individual teeth. Must distinguish between a pseudo-Class III and a true Class III.
 - Pseudo-Class III: Incisal / canine interference produces anterior shift of mandible on closure.
 - Treatment directed at advancement of incisor segment to eliminate interference.
 - Fixed or removable appliances with finger or sweep springs to advance incisors.
 - True Class III: In primary dentition presents classic skeletal and dental patterns with retruded maxilla, prognathic mandible, “adult” concave profile, retroclined lower incisors.
 - Treatment directed at dentofacial orthopedic changes to correct skeletal malocclusion.
 - Reverse pull headgear/ / facemask, chin cup.
- Both pseudo- and true Class III may require concurrent maxillary expansion (See posterior crossbite).

Digit Sucking Habits in the Primary Dentition

- Normal at early age: 50% of children with NNS habit will discontinue between 24-28 months of age.
 - Digit habits can last longer than pacifiers; both produce similar affects if persist past 4 years.
 - Incidence rate of 10 – 15% at age five years.
- May result in anterior openbite, distorted incisor eruption, increased overjet, proclined upper incisors, linguoversion of lower incisors, posterior crossbite with constricted maxilla, possibly Class II relations.
- Consider intervention prior to eruption of permanent anterior teeth approximating age 5 to 6 years if NNS habit persists and patient-parent indicate understanding of need to stop.
 - Use “gentle persuasion” as beginning treatment; behavior modification can be successful.
 - Cribs, rakes, “bluegrass appliance” are choices for fixed therapy to “help” child quit.

Airway Compromise / Mouthbreathing

- May impact on facial growth with tendency to increase vertical orientation (skeletal openbite).
 - Similar occlusion changes as seen with deleterious extraoral habits.
 - Management – Distinguish from extraoral habits. If airway directed, refer for ENT assessment: possible allergy management, tonsillectomy/adenoidectomy, palatal expansion.

III. CLINICAL EVALUATION OF THE MIXED DENTITION

Eruption Timing and Sequencing of Permanent Dentition

Permanent teeth erupt on average beginning at 6 years of age (lower central incisors, upper and lower first molars) and other than third molars is complete by 12 years of age.

- Most common eruption sequence is 6-1-2-3-4-5-7 in the lower and 6-1-2-4-5-3-7 in the upper arch.
 - Above sequences occur only about 50% of the time.
 - Most common variation is eruption of second molars in either arch before more anterior teeth.
- Incisor transition complete by 8 years to establish the mid-mixed dentition of permanent molars and incisors along with buccal segment primary teeth (C-D-E)).
- Buccal segments undergo transition with eruption in the lower arch of the canines around 10 years of age, eruption of upper and lower first premolars approximating age 11-11.5 years, eruption of upper and lower second premolars at age 11.5-12 years and eruption of upper canines at age 12+ years.
- Second molars erupt about 12 years of age approximating lower second premolars & upper canines.

Normal Mixed Dentition Occlusion and Alignment

- After incisor transition in the early mixed dentition years, the incisors normally exhibit:
 - On average, -1.6 mm. of lower incisor “crowding”, S.D. of ± 1 mm. (i.e. slight “crowding” normal).
 - On average, no spacing or crowding in the upper incisor segment (S.D. of ± 1 mm.). The “Ugly duckling” stage is normal transitional appearance with “splayed” maxillary incisors under influence of eruptive positions of adjacent incisors and canines.
 - Overjet - Ideal is no overjet with incisal contact, range is 0 - 3 mm.
 - Overbite - Ideal is about 2 mm. or 30 - 50% vertical overlap, two S.D. range is 0 – 5 mm.
- Incisor Liability: Permanent incisors larger than primary incisors: - 7.1 mm. in upper and – 5.1 mm. in lower. Transition from primary incisors to permanent incisors possible because:
 - Interdental spacing of primary teeth if available - Baume Type I, primate spaces – allows incisor transition with less than mean average of 1 to 2 mm. incisor crowding. Larger basal arch size. If not available, much more likely to end up with crowding at above average levels.
 - Increase in intercanine arch width during incisor eruption and “growth” transition”.
 - Lower intercanine width increase - mean of 2.4 mm. with range of 0 to 5 mm. Note that this intercanine arch width stabilizes after incisor eruption is complete at 8 years of age. Permanent canines will erupt at same arch width as the primary canines occupied.
 - Upper intercanine width increase - mean of 3.0 mm. with range of 0 to 6.5 mm. Another increase of about 2 mm. will occur in the maxillary width when canines erupt at age 12 years.
 - More anterior placement of permanent incisors increasing forward arch perimeter. This is notably more of a factor in the upper arch as lower incisors will tend to retrocline over time after eruption.
- Permanent Molar Relationships In the Mixed Dentition
 - Class I: Maxillary first molar mesial cusp in mandibular molar buccal groove – “Ideal”.
 - End-on Class II: Majority of mixed dentition occlusions. Potentially corrects to Class I with late mesial shift in late transition stages in most cases; but may stay end-on or even shift to full Class II.
 - Full Class II: Maxillary first molar mesial cusp in embrasure between lower first molar and second primary molar or second premolar. About 15% of children express full Class II molars - usually reflection of skeletal malocclusion involving mandibular retrognathia as most common causative factor. Canines also Class II positioning with pronounced overjet of 6 mm. or more.
 - Cl. III: Maxillary first molar mesial cusp distal to lower first molar buccal groove. About 1 to 3% of Caucasian children, usually reflects skeletal malocclusion with mandibular prognathia and maxillary retrognathia. Must discriminate from pseudo-Class III with forward shift of mandible.
- Permanent molar transition positioning influenced by:
 - Primary molar terminal plane relationship (See primary dentition occlusion).
 - Spacing → primary spacing may be closed by “early mesial shift” as first molars erupt.
 - Size differential between primary C-D-E and permanent 3-4-5 teeth (i.e. leeway space) allows “late mesial shift” of first molars when second primary molar exfoliates and permanent first molar moves mesial, often under the influence of erupting second molar.
 - On average, upper leeway space is +0.9 mm. per quadrant.
 - On average, lower leeway space is +1.7 mm. per quadrant.
 - Mandibular growth and differential growth may affect relative A-P positioning.

IV. MANAGEMENT OF THE MIXED DENTITION OCCLUSION

Space supervision: Procedures derived from clinical judgment where the clinician determines a patient's occlusion will have a better chance of optimum development with supervised intervention than without intervention (Moyers).

— **Preventive Orthodontics:** To preserve and maintain normal relationships in the developing occlusion through prevention of oral disease, restorative care, and space maintenance.

— **Guidance of Eruption:** Procedures that influence the eruptive patterns of permanent teeth during transition from primary through mixed dentition. Applicable when overall space adequate to accommodate normal complement of permanent teeth with acceptable esthetics & function (Hotz).

— **Interceptive Orthodontics:** Recognition of developing malocclusion factors & implementation of treatment procedures to eliminate or minimize their effects on the final occlusion.

** Estimates by credentialed orthodontic and pediatric dentistry specialists indicate approximately 50% of children would benefit from guidance and interceptive procedures beyond "preventive" interventions.*

Goals of Mixed Dentition Management of the Occlusion

— Incisor integrity: Satisfactory alignment of anterior teeth without significant midline discrepancy, excessive protrusion, lingual malpositioning, openbite or excessive deepbite.

— Dentitional development without functional problems: Elimination of functional posterior and anterior crossbites, deleterious oral habits and temporomandibular dysfunction (TMD).

— Optimal tooth eruption: Correction of eruption anomalies such as ectopic molars and canines, over-retained primary teeth, delayed permanent tooth eruption, ankylosis, supernumerary teeth.

— Avoid unnecessary extraction of permanent teeth: Optimal use of leeway space and arch perimeter with symmetrical molar positioned without symptomatic space loss.

Clinical Procedures in Space Supervision and Guidance of Eruption

— Preventive and Restorative Dentistry: To preserve arch integrity and overall arch perimeter.

— Space Maintenance: Stabilization of molar and anterior tooth positions to preserve dimensions and prevent symptomatic loss of arch length secondary to premature loss of primary teeth.

— Disking of Primary Teeth: Reduction of mesiodistal primary tooth structure to enhance adjacent permanent tooth alignment through timely use of leeway space.

— Selective Extraction of Primary Teeth - Extension of disking concepts in the timely removal of primary teeth to enhance permanent tooth eruption and alignment positioning.

— Minor Tooth Movements: Biomechanical tooth movements to return or direct developing occlusion to a "normal", not necessarily "ideal" pattern of development. Implies minimal or simple appliance therapy over a short interval of treatment time. Conditions considered for minor tooth movement procedures within the context of interceptive orthodontic include:

- Ectopic eruption of permanent first molars
- Dental / Functional Anterior Crossbites
- Posterior Crossbites
- Oral Habits (Thumb / Digit Sucking)

— Recognition and Correction of Dental Anomalies: Identification and elimination of anomalies and their effects on the developing occlusion to include supernumerary teeth, missing teeth, tooth size / shape anomalies, ankylosis, pathologic lesions, etc.

Space Maintenance in the Mixed Dentition

• Use when space loss is likely, particularly in association with early loss of primary molars around the timing of first permanent molar eruption (See primary dentition space maintenance).

— Work-up includes space analysis, presence and eruptive status of permanent teeth, molar intercusp relationships, incisor positioning, understanding and cooperation.

— Once 6 year molars erupted, bilateral space maintainers advised to control molars and allow buccal segment transition due to eruption patterns and potential loss of abutments.

- Mandibular arch: Lingual holding arch once lower incisors erupted.
- Maxillary arch: Transpalatal arch or Nance appliance.

— Once 6 year molars erupted, space maintainers advised in most situations that involve premature loss of the second primary molars to control first molar positions. Loss of first primary molars if second primary molar remains provides more questionable need for appliances given the buttressing effect of the primary second molar holding the first molar position.

Regaining of Lost Posterior Space

• Indicated if it simplifies, minimizes, or eliminates subsequent orthodontic treatment. Should be accomplished well before permanent second molars eruption has a potential to restrict the first molar distalization procedures (i.e. usually around 8 to 11 years of age).

— Maxillary space regaining: Extraoral headgear, fixed molar “distalizing” appliances (e.g. Distal-jet), or removable ACCO appliance are examples modalities.

— Mandibular space regaining: lip bumper, “active” lingual arch, removable split-saddle.

— Both upper & lower arches candidate for Phase I 2X4 appliances to increase arch length in conjunction with molar up-righting, distalization, and incisor positioning.

Mandibular Incisor Crowding - Arch Length Discrepancies

• Lower anterior crowding considered normal as average alignment expresses -1.6 ± 1.0 mm. of crowding after incisor eruption is complete. Vast majority of children express 0 to 3.5 mm. of crowding at 8 to 9 years of age, and importantly; there are no future arch dimensional changes to compensate for any degree of crowding and malalignment in the lower anterior segment.

— Approach during incisor transition is to allow “wedging” effect of eruption to optimize width.

— After lateral incisor eruption, *what you see is what you get!*

• Space analysis after incisor eruption: *Can crowding be accommodated by use of leeway space?*

— If it can be resolved, intervene with space supervision procedures.

— If space deficiency excessive with greater than 3 to 4 mm. of lower crowding expressed and/or posterior space loss has occurred, plan long-term arch development with expansion non-extraction approach versus serial extraction protocol.

• Considerations for non-extraction arch development approach versus serial extraction include:

— Periodontium - thin labial gingiva or mucogingival defect; expansion risky.

— Profile and incisor position/ angulation – incisors “most” stable where they are found!

— Vertical relationships - Non-extraction therapy tends to open the bite vertically while extraction of permanent teeth tends to deepen bite.

- Open bite hyperdivergent facial pattern directed toward serial extraction protocols.
- Deep bite brachyfacial patterns directed toward non-extraction with arch expansion.

— Premature exfoliation of primary teeth (lateral incisors) and/or excessive resorption of primary canines with ectopic eruption of permanent lateral incisors.

- Guidance interventions involve unraveling any incisor crowding toward posterior “leeway space”.
 - Disking of primary canines >>> 1 to 2 mm. of space per side can be achieved by diskling the mesiolingual corner of the canines to provide a “sluice-way” for incisor alignment.
 - Disking must go subgingival to free contacts while being careful with adjacent permanent laterals. Recommended technique uses tapered crosscut bur (#699).
 - Local anesthesia (block, infiltration, topical compound) may be needed for the subgingival slice . This can be coordinated with restorative treatment planning.
 - Disking of primary canines is indicated with:
 - Less than 3 to 4 mm. of incisor crowding.
 - Laterals have actively erupted into alignment with eruptive width changes complete.
 - Intact primary canine roots (Not ectopically resorbed or toward normal timing of exfoliation).
 - Incisors linguallly malpositioned – the tongue will mold incisors forward if space available.
 - Preferred option, especially in deepbite patterns to maintain vertical support.
 - Extraction of primary canines >>> To enhance arch symmetry, coincident midlines and incisor integrity when incisor liability greater than 4 mm. with distorted incisor positioning.
 - Recommended with asymmetric ectopic loss of primary canine producing a midline shift - extraction of contralateral primary canine to sustain symmetry.
 - The need to extract primary canines or ectopic loss of primary canines are a strong indicator of a significant tooth size-arch size discrepancy. Incisor liability at this level frequently suggests the primary canine extractions are Step One of a first premolar serial extraction program. This is particularly in vertically sensitive dolichofacial openbite patterns where expansion and arch development is problematic.
 - Clinician must relate to parent that early lower canine extractions are not a cure-all - necessity to do so is indicative of significant problems.
 - Consult indicated with clinician who will ultimately do orthodontics as negative effects of early lower canine removal include lingual collapse of incisors, arch length loss, bite deepening, increased overjet - all significant detriments in brachyfacial / deepbite cases.
 - “Early” Phase I arch development >>> Use Edgewise 2X4 to position incisors and molars toward Class I relationships with incisor integrity, midline coincidence, and normal overbite / overjet.
 - Discrepancies requiring arch expansion to relieve crowding and offset negative effects of space loss, ectopic loss or early canine extractions (e.g. retroclined collapsed incisors) are candidates for Phase I 2X4 treatment. Lip bumpers possible adjunct appliance to facilitate arch development.
 - Remember, facial type critical factor in extraction versus non-extraction approach.
 - Brachyfacial / Deepbite >>> Prioritize arch development / expansion.
 - Dolochofacial / Openbite >>> Extraction protocol much more likely.
 - “Late” Supervision of Leeway Space >>> Use lower lingual arch along with selective extraction of primary molars to preserve “E-space”, control late mesial shift and lower incisor up-righting.
 - Timely placement of lingual arch allows distal eruptive positioning of premolars & canines (on average 1.5 mm. distal placement). Provides 2 to 4 mm. of space for relief of incisor crowding.
 - Applicable in two-thirds to three-fourths of children with normal crowding patterns.
 - Initiation of Edgewise therapy to position incisors and molars toward Class I positions while controlling leeway space also applicable in timing with loss of 2nd primary molars.

Ectopic Eruption of First Permanent Molars

- Resorption of the distal root of second primary molars by adjacent erupting six-year molars.
 - Incidence of 2-3% in maxillary arch, rare in lower arch.
 - Reversible “self-correction” reported in two-thirds of cases without significant implications.
 - Irreversible ectopic molars - lack of self-correction by age 7 years, eruption of opposing lower first molar above the occlusal plane are indicators that interceptive intervention is necessary due to :
 - Potential space loss with blocked first molars, loss of second primary molar.
 - Asymmetric arch development - including supraeruption of opposing dentition.
 - Diagnosis - Panorex or adult BWX (#2) at age 5 to 7 years; look for symmetry of eruption timing.
- Treatment concepts:
 - Observation: Since approximately 2/3 self-correct, watchful waiting often legitimate approach if detected at age 5 or 6 years. Rarely self-corrects after age 7.
 - Interceptive treatment to guide 1st molar into normal position, retain favorable eruption sequence, maintain arch length, and maintain level occlusal plane. Considerations include extent of blockage, degree of primary molar resorption, access to ectopic molar, overall arch length status.
 - Brass wire (0.025 - 0.032) or elastic separators (preferred if able to place) - minimal lock.
 - Fixed transpalatal wire from E's with distalization spring to engage the ectopic first molar (Humphrey appliance)
 - Fixed transpalatal wire from E's with distalization elastics to bonded button on ectopic first molar (Halterman appliance) – preferred approach if separators not placeable and there is access to the molar for bonding of molar attachments.

Dental / Functional Anterior Crossbites in the Mixed Dentition

- Defined as maxillary incisors lingually positioned to lower incisors in centric occlusion.
 - Dental: Lingual malpositioned upper incisors related to local tooth displacements – typically 1 or 2 teeth only. Usually over-retained upper primary incisors when maxillary central incisors are involved. If lateral incisors involved, suggests arch size problem.
 - Functional: Dentoalveolar crossbite with lingual displaced upper incisors complicated by anterior shift of mandible to exaggerate discrepancy (pseudo-Class III). Typically incisor edge-to-edge first contact with forward shift to crossbite in maximum intercuspation. Usually multiple incisors involved.
 - Skeletal: True Class III with prognathic mandible and retrognathic maxilla. Usually involves all anterior teeth in crossbite with total anterior and posterior constriction.
- Differential diagnosis: Evaluate CR - CO differences for following variables:
 - Facial Profile - With functional shift becomes more prognathic. Without shift, profile static.
 - Number of Teeth - One or two probably dental; if all incisors then likely functional or skeletal.
 - Mandibular Closure: If patient can self-contact incisors edge-to-edge, functional present.
 - Molar Relationships - Class I > III with shift on closure. Static without shift.
 - Cephalometric Analysis: Skeletal vs. dental, Incisor inclinations a key to diagnosis -
 - Retroclined uppers, proclined lowers = dental / functional
 - Proclined uppers, retroclined lowers = skeletal
 - Familial Appearance: As genetic tendency, expressed in family relations.

- Treatment planning for dental / functional crossbite: Usually involves labialization of maxillary incisors with goal of satisfactory overjet and overbite, elimination of functional displacement. Consider:
 - Space Available – Lingual incisor must have space to move forward into the archform – rarely a problem if diagnosed and treated early in the incisor transition period.
 - Stage of eruption / Access / Degree of overbite – Treatment options influenced greatly by vertical positioning of involved incisor as to ability to position mechanical attachments.
 - Severity of displacements – Early on, usually one or two incisors with space available to move forward and “jump” the bite. Once all incisors erupted in the archform, may need to move some teeth mesiodistally to allow symmetrical alignment and make space to correct the lingual malpositioning.
 - Local etiology – Must ensure over-retained primary incisors, supernumerary teeth, whatever is a factor in displacement are resolved.
 - Cooperation – This is a given in treating children.
 - Mandibular incisor positioning - occasionally needs retraction is excessively “flared”.
- Maxillary incisor directed biomechanics / appliances:
 - Tongue blade/popsicle stick – Patient self-guides using inclined leverage for minimal overlap.
 - Mandibular acrylic inclined plane – Same concept as above as closure guides upper incisor forward pass the lower crossbite teeth. Do not recommend due to potential trauma.
 - Removable Hawley with fingerspring(s): labialize involved upper incisors. Incorporates posterior biteplane to seat appliance, decrease anterior interferences for labial tooth movement.
 - Fixed Palatal rigid archwire from bands on first permanent molars with fingerspring(s): labialize involved maxillary teeth. Bonded lingual composite “button“ on crossbite incisor to engage spring.
 - Labial archwires / Edgewise brackets - In conjunction with other major incisor alignment.

Anterior Openbite With Extraoral Habit in the Mixed Dentition

- Diagnosis: Prolonged digit (thumb, finger) or pacifier sucking habits into the mixed dentition produce likely malocclusion factors, dentoalveolar changes, and abnormal muscle activity.
 - Effects On Occlusion
 - Flaring of maxillary incisors/lingual inclination of lower incisors > Increased overjet
 - Anterior openbite: disrupted incisor eruption / distorted occlusal plane anteriorly.
 - Distortion of Maxillary Alveolar Process
 - Posterior Crossbite -- Definite association if habit prolonged into transitional dentition.
 - Class II molars with alteration of basal bone (?)
 - Abnormal Muscle Activity
 - Tongue Thrust - almost always occurs in response to openbite
 - Perioral dysfunction: Lip and mentalis habit with tongue thrust and overjet / openbite
 - Mouthbreathing: Must differentiate dental vs. skeletal openbite, airway complications.
- Treatment: Eliminate habit and control tongue thrust to allow potential for “self-correction” of incisor openbite. Step-wise protocol dependent on patient age and motivation - “teachable” moment is critical.
 - Watchful Waiting: While O.K. below age 4 to 5 years, as incisor transition period approaches more aggressive management encouraged given potential malocclusion factors.
 - Psychological rewards: first choice at age 4 to 6 years using reward program for three months.
 - Mechanotherapy: Palatal Crib appliance once incisors in transition from 6 to 10 years of age.

- Crib reminds child not to engage in habit, interferes with digit placement, and restrains tongue from forward positioning.
- Promotes incisor self-alignment by eliminating digit and tongue interferences.
- Planned for six-months wear, habit usually ceases within weeks.
- Edgewise appliances: Mechanically align dentition in conjunction with crib therapy.
 - May be necessary in some mixed dentition cases with 2 X 4 mechanics.
 - Usually necessary in late mixed dentition or adolescent patients with full Edgewise appliances.
- Myofunctional Therapy - only if associated speech problems.

Posterior Crossbite In The Mixed Dentition

- Posterior segmental dentition (primary canines, primary molars, permanent first molars, premolars) in transverse displacement with upper teeth positioned lingual to lower (5 - 8 % of children).
 - Dental: An isolated dental malpositioning usually involving 1 or 2 teeth with lingual displacement of involved upper molar or premolar, corresponding buccal positioning of opposing lower tooth.
 - Functional: Lateral shift of mandible due to inadequate maxillary arch width. 90+ % of posterior crossbites in mixed dentition reported to have a lateral shift component that is expressed as a:
 - Lower midline shift to the crossbite side as the mandible deviates on closure.
 - Unilateral lingual crossbite of entire buccal segment from canines back in C.O.
 - Asymmetric Class II molars on crossbite side, Class I – III on non-crossbite side.
 - Asymmetric condylar position: rotates around condylar axis on crossbite side, slides down and forward on non-crossbite side.
 - Facial asymmetry - mandible shorter on crossbite side, longer on non-crossbite side.
 - Skeletal: True transverse discrepancy, usually bilateral presentation with severely constricted upper arch, high palatal vault, midline coincidence in CO and CR positions.
 - If upper dentition buccal to lower, classified as buccal crossbite or “Brodie Bite” (< 1 %).
- Treatment Planning: Directed at establishing normal arch symmetry and shape, coordinated interarch relationships transversely and to eliminate functional displacements (i.e. allow normal closure).
 - Treatment planning considerations include:
 - Stage of Dentition / Appliance Anchorage – Which teeth are available for banding to anchor the active expansion component and how long will the teeth be available.
 - Arch Length / Circumference – Is transverse expansion a major component of crowding relief in terms of incisor malpositioning or is expansion simply to correct transverse discrepancy.
 - Amount of Expansion Needed – How much transverse change is necessary to correct the posterior crossbite – usually about 3 to 4 mm. of “final” overall molar expansion needed for unilateral / functional crossbite patterns, 5 to 8 mm. for bilateral posterior crossbites without shift.
 - Nature of Expansion Emphasized – Orthodontic versus Orthopedic
 - Patient Age – Impacts both teeth available for banding and the nature of response – younger the patient implies less resistance to sutural separation.
 - Molar Rotations / Archform – Mesiolingual rotation of involved molars a common effect of posterior crossbites as is a more tapered archform toward the anterior segments. Correction may be designed to “derotate” molars and/or differentially expand the anterior versus posterior form,

- Habits / Overbite – Posterior crossbites often “caused” or “associated” with extraoral habits, tongue thrust swallowing patterns, and/or mouthbreathing/airway issues. Must be addressed for successful retention of expansion changes.
- Facial Type – Maxillary expansion has tendency to open the bite, so dolichofacial patterns at “risk” for excessive vertical changes.
- Cooperation
- Personal Preference of Clinician – Particularly in younger school-age patients, any of the maxillary expansion appliances may be effective, so choice becomes related to preference.
- Maxillary biomechanics / Maxillary expansion appliances:
 - Cross-arch elastics → Isolated dental displacements – lingual attachments on upper, buccal on lower secure light patient placed elastics. Has extrusive and lateral tipping effects.
 - Removable Schwarz Plate → Provides arch expansion that is limited to lateral dental up-righting and will not provide notable basal orthopedic change – success less than 70% longterm.
 - W-arch / Quad-helix (0.036 S.S. wires) → Functional crossbites in early to mid-mixed dentitions. Provides combination of dental and basal orthopedic change (up to 30 to 50% sutural). Active expansion of 4 to 6 mm. needed to build in expected 2 to 3 mm. transverse relapse for final expansion amount of 3 to 5 mm. at molars to correct functional posterior crossbites. Final expansion at primary canines about half that of permanent first molars. Rotation of molars and anterior arch from typical side effect of the “fanning” action of these palatal based expansion designs.
 - Palatal Expander/Hyrax → Bilateral posterior crossbite to optimize orthopedic sutural separation throughout the mixed and into the adolescent dentition. Indicated for increased anchorage for functional and bilateral crossbites in late mixed dentition once first bicuspids erupted. Final expansion increments of 4 to 6 mm. realized after normative transverse relapse of 2 to 3 mm. Expansion at primary canines about the same as at the permanent first molars, so enhanced anterior segment space increase for crowding relief.

Maxillary Canine Eruptive Displacement

- Maxillary permanent canines exhibit impaction with palatal displacement in 1 - 2% of population (females affected three times more frequently than males). Much more common is severe mesiolabial displacements secondary to segmental crowding.
 - Canine malpositioning often associated with atypical resorption of permanent incisors.
 - Ectopic eruption or impaction may be associated with constricted maxillary intercanine width, agenesis or microdontia of the lateral incisor, and arch length deficiency.
- Early Recognition
 - At 10 to 12 years of age, radiographic evaluation with periapical or panoramic radiographs.
 - Clinical signs: Lateral incisor distal inclinations pronounced, small maxillary lateral incisors present, primary canines not appropriately mobile, eruptive bulging of canines atypical.
- Treatment Intervention
 - Early: Excessive canine mesial orientation may be redirected in more distal and vertical eruption path through selective removal of primary canine around the time the permanent canine has approximately two-thirds root development (i.e. approximating 10 ½ to 11 ½ years of age).
 - If displaced permanent canine overlap of adjacent lateral incisor is not beyond midline long axis of the lateral, chances for normal positioning of permanent canine after primary canine extraction is 85 to 90%.

- If permanent canine overlap is beyond lateral incisor long axis, successful repositioning of permanent canine after primary canine extraction is approximately 60%.
- Successful progress determined at one-year x-ray follow-up with notable improvement in permanent canine positioning. Most problems related to palatal displaced canines.
- Late: Edgewise appliances usually necessary to ensure space for positioning and establish anchorage for orthodontic eruption. Once arch aligned and stabilized > Uncover canine, engage with attachments to orthodontically erupt and align into archform.

Congenitally Missing Permanent Teeth (excluding third molars)

- Incidence of missing permanent teeth is about 4% with no gender differences. Affects two or more teeth in about half of cases, frequently symmetrical pattern involving antimeres. Most frequent are lower second bicuspid and upper lateral incisors at about same rates, upper second bicuspid next. A consideration is that cone-or peg-shaped teeth characteristically seen in association with missing teeth.
- Key issue involves consequences and considerations to long-term arch alignment.
 - Disruption of normal dimensions can result in adjacent teeth drifting, supraeruption of opposing teeth, and improper space accommodation with aesthetic and functional disharmony.
- Key question: *Whether to maintain primary tooth or to allow closure of space?*
 - Location of missing teeth: Mesial eruption paths and alignment tendencies of adjacent permanent canines may compensate for missing maxillary lateral incisors. Such "self-correction" adjustments are less likely to occur in bicuspid areas unless severe arch length discrepancy present and extra space needed for alignment.
 - Number of missing teeth: When bilateral antimeres missing, space closure is often desirable to obviate the need for prosthodontic replacement. If a single tooth is missing, maintenance of space and eventual prosthetic management may be more likely for symmetrical harmony.
 - Patient age: Early recognition of significance as planning options are broader in terms of occlusion development, supervision of arch integrity, and the status of the primary predecessor.
 - Tendency for overlying deciduous tooth to persist until young adulthood. Predictive range is great with some demonstrating premature loss of the primary tooth or, in others; persistence for decades.
 - For primary molars with missing premolars, ankylosis a common factor in planning.
- Missing maxillary permanent laterals:
 - Maintain primary lateral and/or manage and open space orthodontically with long-term plan for prosthetics (implants or Maryland bridge). This is usual the emphasis in non-crowded arches with Class I and Class III occlusion patterns for optimal maxillary archform.
 - Enhance movement of permanent canines forward into lateral position with "early" extraction of primary laterals, later orthodontic alignment for "canine" replacement. This is more likely the emphasis in crowded arches and Class II occlusion patterns to camouflage discrepancy.
- Missing second premolars:
 - Maintain primary molar and/or manage space with long-term plan for implants or bridge. This is usual emphasis in non-crowded arches with Class I and Class II occlusion patterns. Assumes the primary molars are not ankylosed early with notable "submergence" and disruption of arch integrity.
 - Enhance movement of permanent first molars forward with "early" extraction of primary second molar, later orthodontic alignment for full space closure. This is more likely the emphasis in crowded arches and Class III occlusion patterns. Early ankylosis of the primary molar and impact on arch integrity influences the decision.

Ankylosed Teeth

- Lower first primary molars most commonly affected, followed by upper first primary molars, lower second primary molars and upper second primary molars. Also occurs secondary to traumatized primary and permanent anterior teeth.
 - Resorption of ankylosed molars usually proceeds in normal mode with 95% of premolars erupting into proper occlusion with normal periodontal health and alveolar bone height.
 - Most common sequelae is simply delayed transition as to timing.
- Static retention of ankylosed tooth often results in clinical "submersion", supraeruption of opposing tooth and tipping of adjacent teeth with accompanying loss of space. Severity related to how early ankylosis occurred, which tooth involved, which arch.
 - Second primary molars of greater significance to arch integrity than first primary molars. Particularly true when ankylosis occurs prior to eruption of first permanent molar.
 - Greater vertical development of maxillary processes can effectively "bury" ankylosed upper primary molar with more severe consequences. Often requires complicated surgical removal.
- Management / Intervention
 - Early on, clinician may choose to monitor as tooth often shows normal exfoliation. Mesiodistal width and occlusion may be maintained with composite build-ups, stainless steel crowns.
 - Eventual treatment often involves extraction of involved primary molar at later stages if exfoliation is delayed or deflected eruption of the succeeding permanent tooth is manifest.
 - In case of significant vertical disharmony, extraction of ankylosed molar may enhance outcomes by avoiding excess arch collapse and less complicated later extraction. Space maintainers considered unless there is sufficient crowding to justify a serial extraction plan.

Supernumerary Teeth

- Reported in up to 3.6 % of children. Occur approximately ten times more frequently in the maxilla (i.e. mesiodens) than in the mandible. Boys twice as often as girls.
 - Mesiodens: 80% single, 20% two or more. Usually cone-shaped crown with single root.
 - More than 90% are lingually or palatally malpositioned.
 - Approximately 3 of 4 mesiodens remain unerupted and need surgical removal.
- Related to delayed eruption & displacement of adjacent permanent teeth, over-retention of primary teeth, diastemas, abnormal root resorption, follicular or dentigerous cysts, and resultant sequelae.
- Remove when no harm will come to the adjacent developing permanent teeth.
 - Prefer to wait until one-half to two-thirds root development of adjacent permanent teeth – so for mesiodens and permanent incisors around 7 to 9 years of age. Patient age and potential for cooperation also factors in delaying surgical intervention. Watchful waiting allows time for possible eruption of supernumerary, avoidance of surgical exposure.
 - When removed, exposure of permanent teeth with provision of eruption channel recommended. Up to 80% of permanent maxillary teeth spontaneously erupt after supernumerary removed.
 - Orthodontic treatment with Edgewise appliances often necessary to make room for unerupted teeth and to position properly.

VI. ADDRESSING SKELETAL MALOCCLUSIONS IN THE MIXED DENTITION

Overview of Dentofacial Orthopedics

- Defined as biomechanical treatment directed at altering the relationships of the jaws and the activity patterns of orofacial muscles to affect changes in facial proportions.
 - Rationale: Objectives of facial and dental esthetics with functional harmony can rarely be achieved unless basal arch relationships are in orthognathic positions – this allows Class I molar and canine relationships, acceptable overbite and overjet, coordinated transverse archforms.
 - Significance: By definition, to modify growth one must treat during active growth periods in conjunction with pubertal growth spurt or earlier. More severe the skeletal discrepancy, generally the earlier the treatment should be initiated.
- Treatment techniques should employ dentofacial orthopedics that most directly attack the area of discrepancy to modify skeletal growth patterns in all three planes of space.
 - Most Class II, Division 1 malocclusions present with a normal maxilla, notable mandibular retrognathia (85%), a vertical growth tendency, narrowed upper arch, good lower arch with proclined incisors. A full Class II skeletal malocclusion expresses an ANB angle greater than 6 degrees.
 - Most Class II, Division 2 malocclusions present with normal maxilla, mild mandibular retrognathia, a strong chinpoint, deepbite growth tendency, broad archforms, and end-on Class II molar relationships. The ANB angle is typically less than 6 degrees.
 - True skeletal Class III malocclusions present a combination of maxillary retrognathia, mandibular prognathia, negative ANB, vertical growth patterns, transverse maxillary deficiency with upper crowding, and retroclined lower incisors.

Transverse basal arch expansion

- Basal orthopedic maxillary expansion involving sutural separation much more readily achieved prior to anatomical “interlocking” of mid-palatal sutures approximating age 12 years. Fixed Hyrax-type palatal expanders optimize basal orthopedic changes.
 - Optimizes development for mandibular growth and function in approximately 50% of Class II, Div. 1 malocclusions. Frees mandible from constricted retrusion to allow advancement.
 - Almost all Class III patients require expansion as an essential component of correction to coordinate arch widths, relieve crowding, and enhance forward development of maxilla.

Anteroposterior Class II malocclusion > Retrusive Mandible > Functional Appliances

- Promote mandibular growth by advancing mandible with protrusive bite appliance, restrain maxillary forward development for “catch-up”.
 - Most studies indicate increased mandibular skeletal length on the order of 1 mm. above normal changes over course of one full year of treatment with most appliance approaches.
 - Holding mandible forward produces reactive forces on adjacent structures. These reactive forces combine with any enhanced mandibular growth toward the correction of Class II malocclusion by:
 - moving (or restricting) the upper teeth backward
 - moving the lower teeth forward
 - restraining maxillary skeletal growth (i.e., the so-called “headgear effect”)
- Conditions for favorable use of functional appliances include:
 - Treatment carried out during periods of active growth (i.e. on upward slope of growth spurt).

- Favorable growth pattern (i.e. horizontal growth) - Functional appliances increase lower face height and are thus contraindicated in cases with a large LFH (i.e. dolichofacial grower).
- Nasal airway not compromised (dolichofacial patterns are problematic).
- Symmetrical dental arches without major anomalies in position or crowding of the teeth.
- Cooperation: generally require full-time wear for successful change.
- Examples of functional advancement appliances include:
 - Bionator / orthopedic corrector: Removable acrylic design allows eruptive guidance by selective grinding of appliance.
 - Activator: Full maxillary coverage restrains maxillary development. Acrylic design allows eruptive guidance of dentition by selective grinding of appliance.
 - Frankel: Shield design reduces compressive forces of buccal musculature and abnormal lip positioning for arch expansion.
 - Herbst: Telescope design displaces mandible forward with lower dental protraction, distalizing effect on upper molars and restraining effect on maxilla. Fixed design offers less problems with cooperation, more appliance emergency problems.

Anteroposterior Class II Malocclusion > Protrusive Maxilla > Directed Headgear

- Headgear promotes restraint of maxillary dental and skeletal forward and vertical development, distalizes the upper dentition, and allows normal mandibular growth. Orthodontic and orthopedic effects are possible with directed headgear in growing patients.
 - Cervical-pull Headgear: Optimize molar distalization, redirect vertical development, influence maxillary skeletal growth, decrease overbite. Primarily works by:
 - promoting molar extrusion, distalization of crowns - average 3 mm./year distalization.
 - “shearing” effect at sutures enhances displacement of maxillofacial complex with about 0.5 to 1.0 mm. in distal movement of A point.
 - increasing lower face height: FMA increased, pogonion down as mandible rotates.
 - High-pull Headgear: Optimize orthopedic restraint of maxillary growth and minimize vertical eruptive development, enhance overbite.
 - promotes horizontal and bodily movement of molars, distalization effects are minimal.
 - restrains vertical/forward development of molars (i.e. relative “intrusion” of molars).
 - restrains downward/forward growth of maxilla. Effects noted more posteriorly at PNS than at ANS.
 - minimizes FMA and lower face height changes to reduce bite opening.
- Indications for extraoral headgear beyond maxillary protrusion include:
 - Retraction will not compromise nasolabial profile
 - Distalization of buccal segments to gain arch length and optimize Class I molars
 - Anchorage support for incisor retraction
 - Symmetrical A-P positioning
 - Active growth: on upward slope of growth curve
 - Arch expansion desirable to enhance forward movement of mandible
 - Cooperation/understanding of patient/family

Anteroposterior Class II malocclusion with acceptable A-P skeletal / profile relationships

- Promote corrective changes by restraining / distalizing upper dentition, protracting lower dentition.

- Class II elastics: possible orthodontic and orthopedic effects, requires Edgewise appliances.
- Distalize maxillary posterior segments (e.g. headgear, distal jets, ACCO, springs, etc.).
- May incorporate selective permanent tooth extractions to camouflage A-P discrepancy.
- Control of excess vertical facial development
 - Maxillary restraint with high-pull headgear
 - Maxillary restraint with full coverage functional appliances (Combine Activator-Headgear)
- Class II Division 2 malocclusion usually presents normal maxilla, acceptable mandible, severely retroclined incisors and deepbite. The occlusal patterns may be “locking” the mandible in a retruded position by the vertical angulation of the maxillary incisors. Treatment options directed at:
 - Generally avoid extraction protocols given tendency to deepen bite.
 - Unlock mandible by correcting maxillary incisor position as targeted first phase of treatment.
 - If mandible repositions, level and align.
 - If Class II persists, consider function appliance, headgear therapy, Class II elastics.

Anteroposterior Class III Malocclusion

- Restrain mandibular growth >>> Chin-cup therapy
 - Restraint of true mandibular growth length not documented by long-term studies.
 - Primarily redirect mandibular growth direction more vertically rather than in desired A-P sagittal direction. Usually contraindicated given typical dolichofacial growth pattern.
- Protract the maxillary complex >>> Extraoral reverse-pull headgear (facemask)
 - “Redirects” or enhances maxillary growth with forward protraction. Affects on teeth and orthopedic changes depend on force direction, magnitude, duration, time, appliance anchorage, and patient age.
 - Concurrent expansion of maxillary arch with palatal expander may “unlock” occlusion for enhanced maxillary forward movement and possibly restrict mandibular forward development.
 - Concurrent mesial movement of upper molars and incisors helps establish overjet and overbite.
 - May eliminate abnormal muscle function (e.g. functional anterior shift).
 - Application of facemask in primary and early mixed dentition consistently shown to produce most dramatic results for Class III correction in the shortest time period.
 - Treatment concurrent with incisor eruption to optimize growth and occlusal relationships.
 - Early correction concepts allude to the idea that early orthopedic correction of malocclusions ultimately incorporated into future craniofacial growth patterns.
 - Supplemented with concurrent rapid palatal expansion may aid skeletal changes.
 - Results from reverse-pull headgear wear attributed to:
 - mesial movement of maxillary molars/incisors - up to 3 mm./year forward movement.
 - “shearing” effect at sutures to maximize displacement of the maxillofacial complex – about 1.0 mm. forward movement of A point.
 - increased lower face height, FMA is increased, pogonion drops down and back as bite opens to enhance A-P correction - may worsen vertical growth.
 - increases lingual uprighting of lower incisors.

The “Top-Ten” Problems in the Primary/Early Mixed Dentition
Diagnostic and Procedures Guide

<u>Condition</u>	<u>Significance</u>	<u>Radiographic / Cause</u>	<u>Suggestions</u>
I. Over-retained primary incisors	<p>May alter eruption of permanent teeth.</p> <p>May produce anterior crossbite.</p> <p>Malalignment may occur due to drifting of adjacent teeth, asymmetry.</p>	<p>1. Abnormal root resorption of primary tooth.</p> <p>2. Supernumery blocking exfoliation of primary tooth and eruption of permanent tooth.</p> <p>3. Missing permanent teeth.</p>	<p>1. Removal of primary tooth.</p> <p>2. Removal of supernumerary tooth timed with adequate development.</p> <p>3. Maintain primary tooth or remove and manage the space</p>
II. Delayed eruption of permanent tooth	<p>Allows drifting of adjacent teeth.</p> <p>Extrusion of opposing teeth to occur.</p>	<p>1. Missing permanent tooth.</p> <p>2. Supernumerary preventing eruption of permanent tooth</p> <p>3. Blocked permanent tooth due to drifting adjacent teeth.</p> <p>4. Apparent mucosal barrier.</p>	<p>1. Open or close space as required with ortho. May require prosthetics.</p> <p>2. Remove extra tooth.</p> <p>3. Regain space orthodontically</p> <p>4. Expose crown.</p>
III. Diastema between maxillary central incisors	<p>Usually represents normal pattern prior to eruption of maxillary canines</p> <p>May be related mesiodens, missing incisor, tooth size discrepancy, or atypical labial frenum.</p>	<p>1. Mesiodens present.</p> <p>2. Missing laterals.</p> <p>3. Tooth size discrepancy</p> <p>4. Heavy frenum.</p>	<p>1. Extract mesiodens</p> <p>2. Orthodontic evaluation</p> <p>3. Orthodontic evaluation</p> <p>4. Frenectomy after canine eruption and orthodontic alignment.</p>
IV. Premature loss of primary canine	<p>Midline shift of incisors with loss of space and arch collapse.</p> <p>Usually indicates tooth size arch length deficiency.</p>	<p>Prior to premature exfoliation, root resorption may be noted on mesial aspect of primary canine with displaced permanent lateral incisors.</p>	<p>May extract primary canine on opposite side to enhance symmetry.</p> <p>Consider lingual arch with spur to prevent further midline shift and incisor collapse.</p> <p>May require 2x4 alignment.</p>
V. Lower incisor Crowding	<p>May indicate overall arch size inadequacy.</p> <p>May produce a periodontal disturbance</p>	<p>Overlap of incisors, atypical primary incisor resorption.</p> <p>Resorption of mesial surface of primary canine root.</p>	<p>Mixed dentition analysis to determine arch length adequacy.</p> <ul style="list-style-type: none"> ➤ Consider diskling with < 3 to 4 mm. of Incisor liability. ➤ Removal of primary canines with > 4 mm. liability to allow alignment of incisors. ➤ May require 2x4 alignment and/or lingual arch.

VI. Anterior open-bite	<p>May be associated with thumb habit, abnormal swallowing pattern, airway problem.</p>	<p>May appear as curvature in maxillary anterior area, especially on panoramic film.</p>	<p>If thumb or digit habit with tongue thrust >>>> palatal crib therapy to stop habit, restrain tongue, enhance self-correction.</p> <p>If airway or tongue thrust swallowing, referral to ENT for evaluation.</p>
VII. Early loss of primary molars	<p>Allows drifting of adjacent teeth, space loss and arch collapse, extrusion of opposing teeth.</p>	<ol style="list-style-type: none"> 1. Determine development and eruption status of premolars. 2. Missing premolars. 	<ol style="list-style-type: none"> 1. Space maintainer or regainer as required. 2. Space management. May ultimately require orthodontics and prosthetics.
VIII. Ectopic Eruption of first permanent molars	<p>Interference with eruption of first permanent molar.</p> <p>Possible space loss and impaction of second premolar.</p> <p>Supraeruption of opposing dentition.</p>	<p>Resorption on distal surface of second primary molar roots with crown of first permanent molar “hung-up” in area.</p> <p>Assess degree of impaction and extent of resorption.</p>	<p>Monitoring may be O.K. as 2/3 self-correct without intervention.</p> <p>If age 7 years and/or lower molar to occlusal plane, intervene:</p> <ul style="list-style-type: none"> ➤ Brass separating wire, seps. ➤ Distalizing spring or elastics. ➤ Extraction of second primary molar and space regaining appliance may be required.
IX. Ankylosed primary molar	<p>May “submerge” below occlusal plane > allow tipping of adjacent teeth, > extrusion of opposing teeth.</p>	<ol style="list-style-type: none"> 1. Tooth may be below occlusal plane. Assess underlying permanent eruption pattern. 2. Permanent successor absent. 	<ol style="list-style-type: none"> 1. Monitor resorption, usually normal, possible delay. If problem, extract tooth, consider space maintainer. 2. May desire to retain primary molar. Rebuild into correct occlusion. If extraction needed, place space maintainer and plan prosthetics unless orthodontic closure.
X. Functional shift of mandible	<p>Lateral Shift > Narrowed upper arch, particularly intercanine width. May result in lateral mandibular shift/functional posterior crossbite with Class II subdivision asymmetry, midline discrepancy, asymmetric growth.</p> <p>Anterior Shift > Incisor interference associated with CR-CO forward shift into anterior crossbite (pseudo-class III).</p>	<p>None</p> <p>Lateral Ceph. Incisor positions: ⇒Dental/Functional = upper retroclined, lower proclined. ⇒Skeletal = upper proclined, lower reclined.</p>	<p>Selective grinding of primary canines a possible option.</p> <p>Maxillary expansion appliances to coordinate arches and allow normal closure usually required.</p> <ul style="list-style-type: none"> ➤ Quad-helix: Functional X-bite. ➤ Hyrax: Bilateral X-bite <p>Labialize upper dentition to allow normal closure/OB/OJ.</p>