Space Management
in the Mixed Dentition

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Lecture Outline

• Arch length problems in the mixed dentition
• Arch length analyses for measuring crowding
• Prevention and correction of crowding in the mixed dentition

Development of the dentition
in the mixed dentition

Moorrees and Reed, J Dent Res 1963

Normal changes: age 8-13 years old

• Mn arch length decreases 2.3 mm
• Mn arch circumference decreases 3.5 - 4.5 mm
• If crowding is present in the early mixed dentition it will not improve with further growth and development ...but will get worse especially in the Mn arch
Arch length changes from 6 week to 45 year

Bishara et al Angle Ortho 1998

Loss of space and changes in the dental arch after premature loss of the lower first primary molar
Kumari, J Pedo Prev Dent - June 2006

- Space loss in the mandible is mostly due to distal movement of primary cuspid
- The erupting anterior incisors pushed the primary cuspid towards the distal more than the erupting first permanent molar did on the second primary molar towards the mesial

Immediate and six-month space changes after premature loss of a primary maxillary first molar;

- distal drift of the primary canines toward the site of the extraction and palatal migration of the maxillary incisors.
- use of a palatal arch to prevent palatal movement of incisors may be more valuable than the use of band- and-loop space maintainers with regard to preserving the existing dental arch.
- 1 mm of space was lost, not clinically significance to warrant use of a space maintainer.
Effect of premature loss of deciduous molars

Premature loss of the maxillary primary first molar (Mx D/D) before age 11 results in:
- Mx 6/6 and Mx E/E shift mesially
- Mx C/C shift distally
- Mx 4/4 erupt more mesial
- Mx 3/3 erupt labially and blocked out

Traumatic injuries to the teeth

- Early loss of a primary incisor(s) as a result of caries or trauma usually results in very little change in the dentition
- Space maintenance is not necessary
- Teeth can be replaced using either a removable or fixed partial denture for esthetic-social concerns
Premature Loss of Lower Primary Cuspids

- Proffit, W. R. Contemporary Orthodontics Textbook
- Moyers, R. E. Handbook of Orthodontics Textbook

Premature Loss of Lower Primary Cuspids

- Lingual positioning of the incisors, resulting in a decreased arch length and deepening of the bite
- Early loss of primary canines required space maintainer to prevent lingual movement of the incisors
- Unilateral loss of primary cuspid causes a midline shift

Arch length considerations

- Is there crowding?
- How much crowding?
- When to treat? Now or later?
- How to treat?
Lower Incisor Crowding in the Early Mixed Dentition

How to treat?
- Expansion
- Hold leeway space
- Extraction of primary teeth
- Extract permanent teeth later

Arch Length Analysis

- Obtain accurate measurement of mandibular crowding
- To determine if needs treatment
- To determine if extraction or nonextraction case

Arch Length Analyses

- Hixon-Oldfather
- Johnston-Tanaka
- Direct

These analyses do not account for curve of Spee, lower incisor position or facial profile
Arch Length Analyses Articles

• Gardner, "A Comparison of Four Methods of Predicting Arch length"; AJO 1979:75. 387-98. *
• Hixon-Oldfather most accurate analysis. Accurate to within 0.4mm

Hixon-Oldfather
Arch Length Analysis

<table>
<thead>
<tr>
<th>Direct Measurements</th>
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<td>Right</td>
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<td>Anterior</td>
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<td>Incisors</td>
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<td>Space Required</td>
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<td>Right</td>
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<td>Lower</td>
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Hixon-Oldfather

<table>
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<tr>
<th>Measurements</th>
<th>Required</th>
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<td>Thickness Required</td>
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<td>Total</td>
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Arch Length Analysis

Space Available \( \rightarrow \) Compare \( \rightarrow \) Space Required

- Space Excess \( \rightarrow \) OK \( \rightarrow \) Space Deficient

Leeway Space

- Maxillary: 0.9 mm per side
- Mandibular: 1.7 mm per side

Ref: Dr. Hays Nance

Evaluation of Dental Crowding

- Start with the mandibular arch
- Mandible is the contained arch
- Mn midline suture fuses at about one year of age and thus orthopedic expansion is not possible like it is in the Mx.
- Consider preservation of Leeway space for correction of crowding
Lingual arch in the mixed dentition to resolve crowding

- 107 consecutive patients - ave. 8.6 yrs. Soldered lingual arch from Mn 6s to contact cingulum at Mn incisors
- Average crowding -4.85 mm (+/- 2.14 mm). Adequate space was available in 60% of the treated patients

Gianelly, Brennan; AJODO Jan 2000

Crowding should be treated with arch length preservation for the majority of patients

Consider serial extraction rather than expansion for the remaining patients who's crowding cannot be resolved by utilizing the leeway space

An Approach to Resolving Mixed Dentition Anterior Crowding

- Extract Mn Ds (or Cs) to borrow leeway space
- Removable lingual arch
- Place lingual arch at contact area at incisal 1/3 of crown to control rotations
- Adjust LA during 1st 6 months till incisors aligned, then leave passive

H.O. 0.5 mm
**Lingual Arch Treatment**

- No (or slight) forward pressure on lower incisors
- No (or minimal) expansion - hold leeway space is all most cases require

**Increase in arch perimeter due to orthodontic expansion**

A mathematical model to study changes in arch perimeter.

- Molar expansion is least effective in gaining arch perimeter. 5 mm expansion = 1.5 mm increase in arch perimeter
- Canine expansion of 1 mm provides 0.73 mm of space to correct incisor position
- Canine expansion and incisor advancement is most effective in gaining arch perimeter.

**Mandibular arch length increase during mixed dentition treatment - postretention evaluation of stability and relapse**

Little, Riedel, and Stein, AJODO 1990

- Cases tx with fixed edgewise appliances, active lingual arches, lip bumpers, or removable appliances.
- These enlargement method of treatment revealed the poorest stability results compared to their other studies of Mn incisor stability.
Early mixed dentition treatment - postretention evaluation of stability and relapse
Dugoni, Lee, Varela, Angle Ortho 1995

- 25 patients treated with a lower lingual arch in the early mixed dentition
- Removable-adjustable lingual arch
- 3 mm or greater incisor crowding
- Most had extraction of Mn D/D

- Measured irregularity index (IRI) at T1, T2, and T3 (approx age 8, 12 and 28)
- Mean 9.5 years post-retention records
- Initial mean IRI 7.8 mm
- Age 12 mean IRI 1.0 mm
- 9 Yr retention mean IRI 2.6 mm

- The lower incisor alignment was clinically acceptable in 76% of cases in the postretention stage.
- The lingual arch was effective in aligning the lower incisors at Phase II evaluation and reducing the crowding to a IRI index close to zero.
- The lower lingual arch could obtain ideal alignment of the lower incisors without incisor bonds and maintain the alignment by arch length preservation
Summary

• Normal arch dimension changes
• Space consideration with early loss of primary teeth
• Benefits an arch length analysis
• Treatment for early loss of primary teeth and crowding