Extraction in the Mixed Dentition —

I declare that neither I, nor any member of my family, has a financial arrangement or affiliation with any corporate organization which offers financial support or grant monies for this continuing education presentation, nor do I have a financial interest in any commercial product(s) or services I will discuss in this presentation.

“War of Roses” Tennessee Governor’s Race 1886

The Taylor Brothers

N. Nash
Options

1. Space Management
2. Expansion – Arch Development
3. Extraction in the Mixed Dentition
But — Before Options Are Considered —

How Much Space Is Needed?

Space Available

<table>
<thead>
<tr>
<th></th>
<th>Maxillary Arch</th>
<th>Mandibular Arch</th>
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<tbody>
<tr>
<td>Space Required</td>
<td>16.5mm</td>
<td>46.1mm</td>
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<td>Space Available</td>
<td>8.0mm</td>
<td>38.5mm</td>
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<tr>
<td>Deficit</td>
<td>8.5mm</td>
<td>7.6mm</td>
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Option Space Management

Maxillary Arch — Must Have 8.5mm

No Space to Manage
Space Management

Mandibular Arch

Left side — Yes
Right side — 4.6mm

Space Management

Plus Interproximal Reduction?

Space Needed

Maxillary Arch — 8mm
Mandibular Arch — 7.6mm

Interproximal Reduction???

Option

Make Space for the Teeth

Make Space for the Teeth
Expansion — Arch Development
Does Our Science Need to be Consulted?

Yes!

N. Nash
What Happens With No Treatment?

Sinclair and Little (1983)
- Sinclair and Little (1983) reported on a sample of 65 subjects with normal occlusions for changes in the dental arch from the mixed dentition, to early permanent dentition, and into early adulthood.
- Arch length decreased from the mixed dentition into early adulthood while incisor irregularity increased from 13 to 20 years of age.

Richardson (1999)
- Evaluated the changes in alignment in the untreated lower arch at various developmental stages: 7 to 15 years, 13 to 18 years, 18 to 21 years, and 18 to 50 years.
- After evaluation of the dental arch at various developmental stages, Richardson (1999) concluded that the greatest increase in amount of lower incisor crowding occurs between the ages of 13 and 18 years of age (≈ 2.3 mm).

What Happens With Treatment?

Does Arch Length Inevitably Decrease From Mixed Dentition to Adult Dentition?
Yes!
Barrow & White, AJO 1952
Brown, et al, Act, O Scand 1951
Little, et al, AJO 1990
Lundstrom, Dent Pract 1969
Moyers, Handbook of Ortho 1985
Moorees, Harv Univ Press 1959
Nance, AJO 1947
Sinclair, et al, AJO 1983
Sillman, AJO 1964

When Mandibular Incisors Are Proclined During Treatment, Do They Tend to Upright?
Yes!
Nance, AJO 1947
Mills, Brit Ortho Jrn 1966
Litowitz, Angle Ortho July-Oct 1948
Cole, Angle Ortho July-Oct
Hixon, AJO 42:898, 1956
Hixon, Angle Ortho 42:200, 1972
Weinstein, Angle Ortho 33: 1, 1963
Miller, U of Oregon Thesis 1971
Boley, UMKC Thesis 1966
Do Expanded Mandibular Canines Typically Constrict After the Removal of Retention?

Bishara, et al, AJO 1989
Glenn, et al, AJO 1987
Little, et al, AJO 1981
McCauley, AJO 1944
Riedel, Angle Ortho 1966
Sandusky, Thesis 1983
Shapiro, AJO 1974
Sondhi, et al, AJO 1980
Steadman, Angle Ortho 1961
Strang, Angle Ortho 1949, 1952

Yes!

Over expansion was found to be a factor in mandibular incisor relapse.


The Washington Studies Should Not Be Interpreted to Mean That

The Position of the Teeth Does Not Matter


• Arch form tended to return toward the pretreatment shape after retention.
• Greater the treatment change, the greater the tendency for postretention change.
• However, individual variation was considerable.
• Patient’s pretreatment arch form appeared to be the best guide to future arch form stability.


• Twenty-two of the 30 cases (73%) demonstrated clinically unsatisfactory mandibular anterior alignment postretention.
• Intercanine width and arch length decreased in 29 of the 30 cases by the postretention stage.


• At post-retention, 9.0% had irregularity index values of 6.5 mm or more and 47.4% had values equal to 3.5 mm or less.
• Treatment increase of intercanine width and post-retention decrease of intercanine width and arch length were associated with relapse.
There Are No Studies of Patients Treated With Expansion Who Have Been Recalled Twenty Five Years After Treatment

So — What Should We Do?


The Face —

Does Expansion Compromise Facial Esthetics?

It Can!

Many Times It Does

Expansion Can Harm Facial Esthetics

Is There An ANTERIOR LIMIT OF THE DENTITION?

Merrifield’s Z Angle

Ricketts
Expansion – Arch Development
Maxillary Arch — Must have 8.5mm

Now —
Some Specific Questions

Can We Expand the Maxillary Arch?

— Yes —
But Should We?


1mm of Lateral Expansion Yields .66 mm of Arch Perimeter Gain
Expansion Required ≈ 12mm


The mean expansion after adjustment according to the principles of meta analysis was 6.00 mm with a standard deviation of 1.29 mm. Of the 6-mm average, 4.89 mm was retained while wearing retainers...
Finally, in the long-term post-retention study period only 2.4 mm of the residual expansion was reported to have remained. This 2.4 mm of expansion remaining after more than a year or more of post-retention period was no greater than what has been documented as normal growth.


If We Expand the Maxillary Dentition in the Absence of Crossbite — We MUST EXPAND the Mandibular Dentition

Gianelly – “One conclusion is that the use of the maxillary arch as the template for the mandibular arch might jeopardize the stability of the mandibular arch by expanding it in areas that are known to be unstable.”
Is It **Prudent** to Expand the Mandibular Dentition?


Burke et al performed a Meta-Analysis of 26 articles – Evaluated 1233 Patients

Conclusion: Most Prudent Course Is to Maintain the Original Intercanine Dimension

Conclusion – Lateral Maxillary Expansion is Probably **Not** a Good Solution for Our Patient

Lateral Mandibular Expansion is **Not** a Prudent Option

What About Moving the Teeth Distally? **Not Laterally?**
Is There a Posterior Limit of the Dentition?

Yes!!

The posterior limit of the dentition refers to the boundary beyond which teeth cannot be moved distally due to anatomical or physiological constraints. In orthodontics, this concept is crucial for planning treatment and understanding the limitations of certain procedures.

A Modern “Widget”

This Patient is 17 years old.

The second molars are impacted due to distalization mechanics.

We Can Easily Push the Maxillary Teeth Distally

But What About the Mandibular Teeth?

AJO/DO Vol 146, No 2

The use of modern orthodontic appliances, such as “widgets,” can help achieve distalization of teeth, but there are limits to what can be achieved, especially when dealing with the mandible.
Mandibular posterior anatomic limit for molar distalization

Introduction: The purpose of this study was to investigate the mandibular posterior anatomic limit for molar distalization. Methods: Three-dimensional computed tomography scans were obtained in 30 adults with a normal Class I normodivergent facial profile and a normal curve. Mandibular available space was measured in the crown and root regions along the posterior occlusal line connecting the buccal cusps of the first and second molars on the axial slices. It was also measured at the occlusal level on the lateral radiographs derived from the same scans. Results: Mandibular available space determined by computed tomography and 3D cone beam computed tomography was significantly smaller at the root level than at the crown level. Results of the present study were obtained in the 53-year-old group. Conclusions: The present study demonstrated that the posterior position of the mandibular posterior teeth was significantly smaller at the root level than at the crown level. This finding may be useful in determining the presence of root contact with the posterior teeth and in planning orthodontic treatment.

K. Cox

14 Months into Treatment

AJO/DO Vol 141, No 2
Mandibular second molar eruption difficulties related to maintenance of arch perimeter in the mixed dentition

Rebecca Lash Rubin, Tiziano Baccetti, and James A. McNamara, Jr.

Findings / Conclusions
Orthodontic Appliances Intended to Maintain Arch Perimeter in the Mixed Dentition Increase the Probability of Eruption Disturbances of the Mandibular Second Molars.

The Bottom Line on Arch Development

“Most Often the Arch Length Gain Occurs by Lower Incisor Proclination and/or an Increase in Intercanine Width, Both Being NOTORIOUSLY Unstable.”

David Kennedy
Early Treatment Options
PCSO Bulletin – Summer 2010

300 Patients — Four Groups

- Schwarz
- Lingual holding Arch
- Combination of Schwarz & Holding Arch
- Control

Findings / Conclusions
“All 3 Treatment Groups Had a Higher Incidence of Mandibular Second Molar Eruption Difficulty When Compared with the Controls.”
Bowman SJ. “Pulsus a Mortuus Equus” (Beating a Dead Horse)
Arguments About Age – Appropriate Arch Length Alternatives.

Lysle E. Johnston Jr
MORE Bone or LESS Teeth!
That is the Choice!


Today, conscientious orthodontists are being challenged by commercially marketed appliance systems that promise easy solutions and are based on nonextraction dental arch expansion. This is a throwback to orthodontic methods advocated a century ago, long before the evidence-based era of orthodontics, radiography, and periodontology.

Arch Development
Little RM, Riedel RA, Stein A.
It is a FAILURE 87% of the Time
“...this strategy shows greater relapse than other samples we have collected.”


Table I. Descriptive statistics for BMI-only group at 4 time periods

<table>
<thead>
<tr>
<th>Age (yr)</th>
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Table II. Descriptive statistics for BMI-only group at 4 time periods

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<td>1.2</td>
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Mandibular Arch Perimeter Decreased in Both Treated Samples

Am J Orthod Dentofacial Orthop 2006; 130:202-13

What is the Best Choice for Natalie?
Options

1. Space Management
2. Expansion – Arch Development
3. Extraction in the Mixed Dentition

Option

Extraction in the Mixed Dentition

"It is better to have one or two teeth less in each jaw, provided it can be compensated by a suitable arrangement, than to have the entire set of teeth poorly arranged and ill at ease…"


By sacrificing the (deciduous) canine teeth to the incisors and the small molars (premolars) to the (permanent) canines it will be possible to leave free space to make an attractive arrangement.


In 1896, J.F. Colyer advocated extractions “to gain room for the crowns and roots, to decrease mechanical treatment and in many cases to abolish it as well as to relieve the pressure on the teeth and prevent caries, to improve the bite, and finally to have the teeth naturally assuming a better position”.


Special Knowledge is Required

The phrase *Serial Extraction* has resulted in the poorly planned removal of teeth by people who do not have the necessary knowledge.

Jack Dale


Hotz’s Guidance of Eruption implies that knowledge of growth and development is necessary to direct the teeth as they erupt.

“Guidance of Occlusion – an even better term because occlusion is the final destination of a tooth that is erupting.”

— Jack Dale

Orthodontics

*Current Principles & Techniques*

Grober • Variusdahl • Vig
This chapter is THE State of the Art work on extraction of teeth in the mixed dentition.

- Fabulous Illustrations
- Impeccably Referenced
- Meticulous Explanations

109

This chapter is a MUST reference for every clinical orthodontist.

110


111

Heath J. The interception of malocclusion by planned serial extraction. New Zealand J. 1953;49:77-88.


112


113


114


Prior to ANY Extraction Decision

Complete Records ↓

Treatment Plan

A Careful Analysis

• Face
• Skeletal Pattern
• Teeth

The Face

Mixed dentition extraction procedures seem to work best when the face has balance or is at best, mildly protruded.

The Face

Mixed dentition extractions are generally contraindicated in a convex or concave face.
The Skeletal Pattern

Vertical Dimension should be within NORMAL Limits

The Skeletal Pattern

Mixed dentition extractions are generally contraindicated in patients with hyperdivergent or hypodivergent skeletal patterns.

The Skeletal Pattern

The anteroposterior relationship of the maxilla to the mandible should be “normal.” If the mandible is either retrognathic or prognathic, mixed dentition extractions are generally not indicated.
What About Mixed Dentition Extraction in the Class II Dental Relationship?

Proceed with Caution!

Be Prepared to
1) Correct the Class II Molar Relationship with Mandibular Extraction
2) Treat to a Class I Canine / Class II Molar
The Dentition
The Clinician MUST ascertain the space required and the space available.

And — Other Factors?


Arch Length/Tooth Size Deficiency

- How much crowding would indicate that extractions of permanent teeth may be indicated?
- 7mm or more of crowding was an indication (Ringenberg)
- 10 mm or more of crowding (Proffitt)
The Dentition
There are several methods that can be used to predict the space needed and the space required. Whatever the method of choice, USE IT!


“Tanaka and Johnston Analysis seems to be the one most frequently used since it is a pure calculation.”

The “Dale” Method
- Space Available vs Space Required
- Curve of Spee Correction
- Evaluation of Protrusion (Its Correction Requires Space)
- Posterior Dentition Area Evaluation

Jack Dale, Chapter 11

Therefore, a THOROUGH Study of:
- The Face
- The Skeletal Pattern
- The Dentition
MUST Be Done in Order to Formulate a Mixed Dentition Extraction Treatment Plan.

Age 9
Four First Premolars Were Removed During the Mixed Dentition.

Age 11

What is the Best Choice for Natalie?

Four First Premolars and Mandibular Deciduous Teeth Were Removed

N. Nash
N. Nash

Is Mixed Dentition Extraction Expedient For the Majority of Crowded Class I Dentitions? **NO!!!!**

M. Denman

M. Denman

M. Denman

M. Denman

M. Denman Pretreatment

<table>
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<tr>
<th>Metric</th>
<th>Value</th>
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Extraction of Teeth in the Mixed Dentition — A Reasonable Option for Selected Patients?
Two Key Words

- Reasonable
- Selected

In My Caveman Practice — Less Than 10%!! of the Patients Between the Ages of 8 and 12 Have Mixed Dentition Extractions

If It Is Reasonable — And If the Patient Has the Criteria

IT IS A GREAT PATIENT SERVICE!

Fifty-Eight Years After Mixed Dentition Extraction

No Other Treatment
Thank You!

Age 68