Factors of Success in Orthodontics and Dentofacial Orthopedics: What to Do and How to Do it

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2010
“What is true is often incomprehensible, and what is easily comprehensible is generally not true”  A. Petrovic
THE ROLE OF “EVIDENCE-BASED” DENTISTRY IN EVERYDAY PRACTICE

Keeping current with advances in dentistry and being able to manage patients who have complex needs and demands is a challenge for practising dentists.

Each day, we are inundated with information about new techniques, tests, procedures, materials or products.

Are all these “new” treatment or products reliable and effective?? The dilemma arises in deciding when something “new” is better than our current clinical management strategy.
WHERE DO WE FIND INFORMATION ABOUT THE EVIDENCE??

American Journal of Orthodontics and Dentofacial Orthopedics

European Journal of Orthodontics

AAO Meetings

CE Courses

Can we trust the information??
Evidence of World Global Warming

GOAL FOR THE RESEARCHER ➔ TO AVOID MISTAKES
THE BEST SCIENTIFIC ARTICLE OR THE BEST SCIENTIFIC PRESENTATION IS THE ONE THAT AVOIDS THE GREATEST NUMBER OF METHODOLOGICAL MISTAKES

GOAL FOR THE READER (CLINICIAN) ➔ TO DETECT MISTAKES
THE GREATER THE NUMBER OF METHODOLOGICAL MISTAKES YOU ARE ABLE TO SELECT, THE LESS YOU HAVE TO TRUST THAT SCIENTIFIC ARTICLE OR PRESENTATION
In stroke play, the player with the lowest score wins.....

(smallest number of mistakes)
BIAS

“Any systematic error that results in inaccurate estimation of an effect or of a clinical result”

Encyclopedia of Biostatistics, Armitage and Colton, 1998

• Selection bias
• “Learning curve” bias
• Measurement error
• “Fishing expedition” bias
• Susceptibility bias
BIAS

• **Selection bias**

The sample of patients should be selected so that it represents the population that is affected by the disease to be investigated.

If not, a *selection bias* may occur and the conclusions of the study cannot be transferred to the “real” population looking for examples…
This study on gengivitis due to accumulation of bacterial plaque was conducted on a sample of dental students at an University Campus.

The sample DOES not represent at all the normal population of patients that attend private dental practices.
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“Learning curve” or proficiency bias

This bias can occur in studies analyzing the effects of “New treatment techniques” that require a substantial level of ability by the clinician.

The proficiency of the clinician usually tends to increase along with time and therefore the patients who were treated first should not be included in one group only.
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- “Fishing expedition” bias
- Susceptibility bias
BIAS

• Measurement error bias

MEASUREMENT ERRORS IN A CEPHALOMETRIC STUDY

1. Ignorance about the magnification factor of the ceph
2. Error in landmark location and tracing
3. Error in measuring
BIAS

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Encyclopedia of Biostatistics, Armitage and Colton, 1998

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- Measurement error
- “Fishing expedition” bias
- Susceptibility bias
BIAS

• “Fishing expedition” (data dredging) bias

This error can occur when a very large number of variables (measurements either correlated or not correlated) is analyzed in the hope to derive some statistically significant result.

Cephalometric studies should avoid the use of redundant measurements for the same dentofacial characteristics.
<table>
<thead>
<tr>
<th>Cephalometric Measures</th>
<th>Pseudoral Trained Group (PTG)</th>
<th>Pseudoral Control Group (PCG)</th>
<th>PTG vs PCG</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Maxillary Skeletal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNA (°)</td>
<td>0.7</td>
<td>1.6</td>
<td>0.4</td>
<td>1.1</td>
</tr>
<tr>
<td>P-A to Nasion (mm)</td>
<td>1.3</td>
<td>1.3</td>
<td>0.7</td>
<td>1.4</td>
</tr>
<tr>
<td>Co-P-A (mm)</td>
<td>4.9</td>
<td>2.0</td>
<td>5.2</td>
<td>2.3</td>
</tr>
<tr>
<td>Mandibular Skeletal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNA (°)</td>
<td>1.0</td>
<td>1.0</td>
<td>0.3</td>
<td>1.5</td>
</tr>
<tr>
<td>Pog to Nasion (mm)</td>
<td>3.3</td>
<td>3.3</td>
<td>1.6</td>
<td>3.0</td>
</tr>
<tr>
<td>Co-Gn (mm)</td>
<td>8.0</td>
<td>2.8</td>
<td>7.7</td>
<td>2.4</td>
</tr>
<tr>
<td>Maxillary/Mandibular</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANB (°)</td>
<td>-0.3</td>
<td>1.5</td>
<td>0.2</td>
<td>1.1</td>
</tr>
<tr>
<td>WITS (mm)</td>
<td>0.4</td>
<td>2.5</td>
<td>1.1</td>
<td>1.9</td>
</tr>
<tr>
<td>Max. Mand. deviation (mm)</td>
<td>3.1</td>
<td>2.5</td>
<td>2.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Vertical Skeletal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FH to palatal plane (°)</td>
<td>-0.3</td>
<td>1.6</td>
<td>0.2</td>
<td>1.7</td>
</tr>
<tr>
<td>N-MP (°)</td>
<td>-2.9</td>
<td>2.2</td>
<td>-0.7</td>
<td>2.2</td>
</tr>
<tr>
<td>Pal. pt. to nasion (°)</td>
<td>-2.6</td>
<td>1.9</td>
<td>-1.1</td>
<td>2.3</td>
</tr>
<tr>
<td>AFs to SNA (°)</td>
<td>2.5</td>
<td>1.1</td>
<td>3.6</td>
<td>2.0</td>
</tr>
<tr>
<td>ANS to Ms (mm)</td>
<td>2.4</td>
<td>2.1</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>N-MS (mm)</td>
<td>3.1</td>
<td>2.3</td>
<td>6.9</td>
<td>3.1</td>
</tr>
<tr>
<td>Co-Gn (mm)</td>
<td>5.8</td>
<td>2.2</td>
<td>4.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Cog-Ms Angle (°)</td>
<td>-2.5</td>
<td>2.0</td>
<td>-0.7</td>
<td>3.8</td>
</tr>
<tr>
<td>Cond. to max. plane (°)</td>
<td>-1.9</td>
<td>1.9</td>
<td>0.3</td>
<td>2.8</td>
</tr>
<tr>
<td>Interdental</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overjet (mm)</td>
<td>-0.2</td>
<td>1.4</td>
<td>0.2</td>
<td>1.4</td>
</tr>
<tr>
<td>Overbite (mm)</td>
<td>1.8</td>
<td>1.7</td>
<td>0.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Incisor inclination (°)</td>
<td>1.1</td>
<td>5.4</td>
<td>4.6</td>
<td>6.2</td>
</tr>
<tr>
<td>Molar relationship (mm)</td>
<td>-0.1</td>
<td>2.7</td>
<td>0.3</td>
<td>3.3</td>
</tr>
<tr>
<td>Mandibular Dentoalveolar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U1 to P-A vert (mm)</td>
<td>1.0</td>
<td>1.3</td>
<td>0.4</td>
<td>1.2</td>
</tr>
<tr>
<td>U1 to FH (°)</td>
<td>1.4</td>
<td>5.2</td>
<td>-1.0</td>
<td>3.2</td>
</tr>
<tr>
<td>U1 horizontal (°)</td>
<td>1.2</td>
<td>1.6</td>
<td>0.5</td>
<td>1.9</td>
</tr>
<tr>
<td>U1 vertical (mm)</td>
<td>1.7</td>
<td>1.5</td>
<td>1.7</td>
<td>2.0</td>
</tr>
<tr>
<td>U6 horizontal (mm)</td>
<td>1.0</td>
<td>1.3</td>
<td>0.1</td>
<td>3.2</td>
</tr>
<tr>
<td>U6 vertical (mm)</td>
<td>2.0</td>
<td>1.3</td>
<td>1.9</td>
<td>1.3</td>
</tr>
<tr>
<td>Mandibular Dentoalveolar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Li to P-A Pg (mm)</td>
<td>0.3</td>
<td>1.3</td>
<td>-0.3</td>
<td>1.2</td>
</tr>
<tr>
<td>Li to MP (°)</td>
<td>0.5</td>
<td>3.7</td>
<td>-0.7</td>
<td>3.7</td>
</tr>
<tr>
<td>Li horizontal (mm)</td>
<td>0.3</td>
<td>1.3</td>
<td>-0.3</td>
<td>1.2</td>
</tr>
<tr>
<td>Li vertical (mm)</td>
<td>2.9</td>
<td>1.3</td>
<td>1.9</td>
<td>1.2</td>
</tr>
<tr>
<td>Li6 horizontal (mm)</td>
<td>0.4</td>
<td>2.7</td>
<td>-0.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Li6 vertical (mm)</td>
<td>2.6</td>
<td>2.0</td>
<td>1.9</td>
<td>1.3</td>
</tr>
<tr>
<td>Soft tissue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UL to E plane (mm)</td>
<td>0.8</td>
<td>1.6</td>
<td>1.6</td>
<td>2.1</td>
</tr>
<tr>
<td>LL to E plane (mm)</td>
<td>1.7</td>
<td>1.4</td>
<td>1.7</td>
<td>5.3</td>
</tr>
<tr>
<td>Mandibular angle (°)</td>
<td>-4.2</td>
<td>8.2</td>
<td>0.3</td>
<td>8.2</td>
</tr>
</tbody>
</table>

*p=0.05; NS = Not Significant
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• Susceptibility bias
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• Susceptibility bias
  It occurs when the effects of treatment are investigated in subjects who are particularly susceptible to develop a positive/negative outcome

looking for examples...

Mandibular changes produced by functional appliances in Class II malocclusion: A systematic review

Paola Cozza, Tiziano Baccetti, Lorenzo Franchi, Laura De Toffol and James A. McNamara Jr

*Am J Orthod Dentofac Orthop 2006;129:599.e1-599.e12*
**Fundamental Concept in Dentofacial Orthopedics:**
The greatest effects of functional/orthopedic appliances occur when the peak in mandibular growth is included in the treatment period.

**Clinical research**
Malmgren et al., AJO/DO, 1987
Hägg and Pancherz, EJO, 1988
Petrovic et al., CGS, Vol. 23, 1990
Baccetti et al., AJO/DO, 2000
Faltin et al., Angle Orthod, 2003
Fundamental Concept in Dentofacial Orthopedics:
The greatest effects of functional appliances occur when the peak in mandibular growth is included in the treatment period

Negligence: Tx performed well before puberty

BIASED CONCLUSION: Functional appliances do not work (the conclusion is biased when the appliances are used at a time that is unfavorable from a biological point of view - “too early”)
Table 1: Treatment Timing

<table>
<thead>
<tr>
<th>Articles</th>
<th>Study design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jakobsson, 1969</td>
<td>RCT, L</td>
</tr>
<tr>
<td>Pancherz, 1982</td>
<td>P, L, CCT</td>
</tr>
<tr>
<td>McNamara et al., 1985</td>
<td>R, L, CCT</td>
</tr>
<tr>
<td>Jakobsson and Paulin, 1990</td>
<td>R, L, CCT</td>
</tr>
<tr>
<td>McNamara et al., 1990</td>
<td>R, L, CCT</td>
</tr>
<tr>
<td>DeVincenzo, 1991</td>
<td>R, L, CCT</td>
</tr>
<tr>
<td>Windmiller, 1993</td>
<td>R, L, CCT</td>
</tr>
<tr>
<td>Nelson et al., 1993</td>
<td>RCT, L</td>
</tr>
<tr>
<td>Perillo et al., 1996</td>
<td>R, L, CCT</td>
</tr>
<tr>
<td>Tulloch et al., 1997</td>
<td>RCT, L</td>
</tr>
<tr>
<td>Illing et al., 1998</td>
<td>P, L, CCT</td>
</tr>
<tr>
<td>Franchi et al., 1999</td>
<td>R, L, CCT</td>
</tr>
</tbody>
</table>

Only 7 out of the 22 studies reported information about skeletal maturity of treated/untreated subjects by means of a biological indicator (hand and wrist analysis, CVM method, etc.).
# Systematic review of the literature

<table>
<thead>
<tr>
<th>Articles</th>
<th>Study design</th>
<th>Appliance</th>
<th>Skeletal Maturity</th>
<th>Suppl Mand Elongation Vs Class II controls (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pancherz, 1982</td>
<td>P, L, CCT</td>
<td>Herbst</td>
<td>Peak</td>
<td>2.2</td>
</tr>
<tr>
<td>Tulloch et al., 1997</td>
<td>RCT, L</td>
<td>Bionator</td>
<td>Pre-peak</td>
<td>1.6</td>
</tr>
<tr>
<td>Franchi et al., 1999</td>
<td>R, L, CCT</td>
<td>Herbst</td>
<td>Peak</td>
<td>2.7</td>
</tr>
<tr>
<td>Baccetti et al., 2000</td>
<td>R, L, CCT</td>
<td>TB pre-peak</td>
<td>Pre-peak</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>R, L, CCT</td>
<td>TB peak</td>
<td>Peak</td>
<td>6.7</td>
</tr>
<tr>
<td>Faltin et al., 2003</td>
<td>R, L, CCT</td>
<td>Bio pre-peak</td>
<td>Pre-peak</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>R, L, CCT</td>
<td>Bio peak</td>
<td>Peak</td>
<td>4.3</td>
</tr>
<tr>
<td>O'Brien et al., 2003</td>
<td>RCT, L</td>
<td>Twin Block</td>
<td>Pre-peak</td>
<td>1.5</td>
</tr>
<tr>
<td>De Almeida et al., 2005</td>
<td>R, L, CCT</td>
<td>Herbst</td>
<td>Pre-Peak</td>
<td>1.7</td>
</tr>
</tbody>
</table>

* Effective outcome (>2 mm): *  
  “Pre-Peak” samples = 1 out of 5 samples  
  “Peak” samples = 4 out of 4 samples
- Do functional appliances produce effective changes in mandibular growth?

No one of the 4 RCTs reported an effective change in mandibular length induced by functional appliances.

2 RCTs
(Tulloch et al., 1997; O’Brien et al., 2003)
TX at a PRE-PUBERTAL STAGE (skeletal maturity)

1 RCT
(Jakobsson, 1967)
TX at a VERY EARLY AGE (start at 8.5ys - end at 10.5ys)

1 RCT
(Nelson et al., 1993)
TX in the Early Mixed Dentition (Pre-Pubertal)

TOO EARLY !!!
Typical behaviors of the clinician who is content with what he has always done in his or her practice, and who does not need to keep updated or to worry about the evidence-based value of his or her treatment protocols.
Factors of Success in Orthodontics and Dentofacial Orthopedics

Patient

Treatment
Factors of Success in Orthodontics and Dentofacial Orthopedics

Patient

1. Timing of Treatment: Individual Dentoskeletal Maturity
Cervical Vertebral Maturation Method

The Cervical Vertebral Maturation (CVM) Method for the Assessment of Optimal Treatment Timing in Dentofacial Orthopedics

Tiziano Baccetti, DDS, PhD, Lorenzo Franchi, DDS, PhD, and James A. McNamara Jr, DDS, PhD

(Seminars in Orthodontics 2005;11:119-129)
<table>
<thead>
<tr>
<th>1,000 Subjects</th>
<th>CS1</th>
<th>CS2</th>
<th>CS3</th>
<th>CS4</th>
<th>CS5</th>
<th>CS6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Mixed</td>
<td>241 (96.4%)</td>
<td>9 (3.6%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>(N=250)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate Mixed</td>
<td>169 (67.6%)</td>
<td>71 (28.4%)</td>
<td>10 (4%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>(N=250)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late Mixed</td>
<td>78 (31.2%)</td>
<td>61 (24.4%)</td>
<td>90 (36%)</td>
<td>21 (8.4%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>(N=250)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Early Permanent</td>
<td>18 (7.2%)</td>
<td>47 (18.8%)</td>
<td>76 (30.4%)</td>
<td>74 (29.6%)</td>
<td>27 (10.8%)</td>
<td>8 (3.2%)</td>
</tr>
<tr>
<td>(N=250)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Graph showing the percentage distribution of subjects across different developmental stages for CS1 to CS6.

Pre-Pubertal!!!
Class II Treatment Timing for Functional Appliances
Class II Treatment Timing for Functional Appliances

- Treatment of Class II Malocclusion at a Pre-Pubertal Stage of Development ("Early Treatment") does not produce a clinically significant supplemental elongation of the mandible (range: 1.5mm-1.9mm) (Level of evidence: RCT)

- Treatment of Class II Malocclusion at a Pubertal Stage of Development ("Treatment including the Peak in Mandibular Growth") produces a clinically significant supplemental elongation of the mandible (range: 2.2mm-6.5mm) (Level of evidence: CCT+ New Evidence in press)
FJO at the Adolescent Growth Spurt concurrent with/followed by Fixed Appliances

**Advantages!**

1. **Effectiveness** (>3 mm extra mandibular growth; longterm data: *Faltin et al, ’03; Freeman et al., ‘09*)

2. **Shorter duration of active therapy**
   2 ys (vs 4 ys, when FJO is used as Phase I tx)

3. **Better stability** (optimal final intercuspation; end tx at postpubertal age)
Growth in Untreated Class II Malocclusion
Increments in mandibular length (Co-Gn, mm)

Total difference in Co-Gn in Class II vs Class I after the Pubertal Peak (CS4-CS6) is minimal:

\[-0.7\text{ mm}\]

Stahl F., Franchi L., Baccetti T., McNamara JA Jr. AJO/DO, July 2006
The minimal amount of growth in Class II subjects after puberty (and the lack of a difference in growth with regard to Class I subjects during the same interval) may assist in the stability of outcomes of orthopedic/orthodontic intervention on Class II malocclusion performed at puberty.

Dentofacial growth changes in subjects with untreated Class II malocclusion from late puberty through young adulthood

Tiziano Baccetti, DDS, PhD, Franka Stahl, DDS, PhD, and James A. McNamara Jr, DDS, PhD

D.S. female: Treated with the twin block followed by FA

CS 3 (peak)
12ys 7mos

CS 4
13ys 10mos

CS 5
14ys 10mos
C.R. female: Treated with the twin block followed by FA

CS 3 (peak)  
13ys 6mos

CS 4  
14ys 10mos

CS 5  
16ys
D.S. female: Treated with the twin block followed by FA

CS 4 (postpeak)
12ys 2mos

CS 5
13ys 1mo

CS 6
16ys
Class III Treatment Timing for RME/Facemask Therapy
RME & Facial Mask: Early vs. Late

PERIODIC VARIATIONS IN GROWTH RATE

Growth per unit of time

CS 1

CS 3

Infantile  Juvenile  Adolescent  Adult

Age
A.T. 8 ys - 11 ys - 18 ys: **Early Treatment**

*Pre-tx*  |  *Post-retention*  |  *Long-term*

CS 1  |  CS 2  |  CS 6
FH-Mand P.°
8 ys = 24°
18 ys = 21°
Growth of the Mandible

(Petrovic e Stutzmann, 1972-1995; Baccetti et al., 2005)

Condylar growth decelerated

Condylar growth accelerated

Condylar growth decelerated
“In those patients who receive a first phase of treatment at a pre-pubertal phase of development and do not achieve a completely satisfactory correction of the malocclusion, a second phase of RME/face mask therapy can be accomplished at the peak in skeletal growth with the more limited aim of restricting mandibular growth”.

RME & Facial Mask: “Two-chance” treatment
Treatment Timing for Maxillary Expansion and Treatment of Transverse Disharmonies
Treatment Timing for Rapid Maxillary Expansion

Tiziano Baccetti, DDS, PhD, Lorenzo Franchi, DDS, PhD, Christopher G. Cameron, DDS, MS, James A. McNamara Jr, DDS, PhD

(Angle Orthod 2001;71:343-50)

Pre-pubertal  
Skeletal changes

Post-pubertal  
Dento-alveolar changes
Maxillary Expansion

Goal:

Uni- /Bilateral Posterior Crossbite
**Unilateral/Bilateral Posterior Crossbite**

*Target structure*: Midpalatal Suture

*Appliance*: RME

*Forces delivered*: Orthopedic

(1.5 – 5 kgs)

1-2 activations/day

**Overcorrection!**

*Retention*: At least 5 months
Unilateral Posterior Crossbite

MANDIBULAR LATERAL SHIFT:

IF NOT CORRECTED EARLY

MANDIBULAR ASYMMETRY

*Kilic et al., AJODO 2008*

*Personal investigation (UMGS):*
14 subjects with unilateral cx-bite from CS 1 trough CS 4:
ASYMMETRY IN RAMUS HEIGHT DOUBLES
(average at CS 1 = 2.1 mm; at CS 4 = 4.3 mm)
Maxillary Expansion

Goal:
Tooth-size/Arch-size Discrepancy

Timing

?
Long-Term Stability of Rapid Maxillary Expansion Concurrent with Schwarz Appliance Therapy in the Mixed Dentition

O’Grady PW, McNamara JA Jr, Franchi L, Baccetti T

Am J Orthod Dentofacial Orthop
130: 202-213, 2006
MANDIBULAR DENTOALVEOLAR DECOMPENSATION INITIATED A FEW MONTHS BEFORE MAXILLARY EXPANSION (10 MM EXPANSION!)
Maxillary Expansion

Indications & Timing

Tooth-size/Arch-size Discrepancy

LONGTERM GAIN IN THE PERIMETER OF THE 2 ARCHES = 2.5 to 4 mm
Later?

Late mixed dentition
Early permanent dentition
Pubertal ages (CS 2-3)

Long-term Evaluation of
Rapid Maxillary Expansion
Followed by
Fixed Appliance Therapy

McNamara JA Jr, Baccetti T,
Franchi L, Herberger TA

Angle Orthodontist
73: 344-353, 2003
Maxillary Expansion

Indications & Timing

Later

Tooth-size/Arch-size Discrepancy

LONGTERM GAIN
IN THE PERIMETER OF
THE 2 ARCHES = 4.5 to 6 mm
Expansion to gain arch perimeter:

- Generous amount of expansion is needed (10 mm)
- Only mild-to-moderate crowding can be corrected by means of arch expansion
- Decompensation of the lower arch prior to maxillary expansion can improve the results
- To defer expansion to a pubertal age (CS 3-4) *(in the late mixed or early permanent dentitions)* reduces the time interval before fixed appliances and may assist in the stability of the results
One of the main targets of orthopedic treatment is...

... the correction of the deficiency in ramus height

K.P. ♀
8 yr, 7 mo
13 yr, 6 mo

Pearson, 2000
Treatment effects of the acrylic splint expander and the vertical-pull chin cup in patients with increased vertical dimension.
Treated Sample
(Subjects with skeletal open bite – MPA>25°
treated with bonded RME and vertical-pull chin cup)
(36 subjects)

• Early-Treated Group (ETG) *
21 subjects
T1 = 8 y 8 mo ± 9 mo
T2 = 11 y 5 mo ± 9 mo
T1-T2 = 2 y 7 mo ± 11 mo

• Late-Treated Group (LTG) **
15 subjects
T1 = 9 y 4 mo ± 1y 1 mo
T2 = 12 y 4 mo ± 10 m
T1-T2 = 3 y ± 10 mo

(ETG) * = Treatment was completed before the peak (CS 1 - 3)
(LTG) ** = Treatment included the peak (CS 3 - 5)
Control Sample
(Untreated subjects with skeletal open bite – MPA >25°)
(30 subjects)

- Early-Control Group (ECG) *
  18 subjects
  T1 = 8 y 5 mo ± 1 y
  T2 = 11 y 2 mo ± 11 mo
  T1-T2 = 2 y 8 mo ± 11 mo

- Late-Control Group (LCG) **
  12 subjects
  T1 = 9 y 9 mo ± 1y 2 mo
  T2 = 13 y 1 mo ± 10 mo
  T1-T2 = 3 y 4 mo ± 11 mo

(ETG) * = Observation period before the peak (CS 1 - 3)
(LTG) ** = Observation period included the peak (CS 3 - 5)

UofM Growth Study
ETG: treatment before the peak

Co-Go mm: -0.4
Gonial Angle °: 0.1
MPA °: -0.1

LTG: treatment including the peak

Co-Go mm: +1.6 *
Gonial Angle °: -1.7
MPA °: -2.0 *

net changes versus controls
EXTREME CASES
Skeletal Vertical Dysplasia

in a subject affected by

Fiber-Disproportion Type of Miotonic Dystrophy

11 ys 6 mos, male
Before therapy

Co-Go = 42 mm
MPA = 32°

Appliance:

Posterior Bite-Block with Elastic Resin (Myoprogress™)
After 3 years of therapy:

Co-Go = 58 mm (+16 mm !!)
MPA = 29° (-3.0° )
..and in non-extreme open bite cases (thumb-suckers)??

Dentoskeletal changes associated with fixed and removable appliances with a crib in open-bite patients in the mixed dentition

Veronica Giuntini, Lorenzo Franchi, Tiziano Baccetti, Manuela Mucedero, Paola Cozza

Dentoskeletal changes associated with fixed and removable appliances with a crib in open-bite patients in the mixed dentition

Veronica Giuntini, Lorenzo Franchi, Tiziano Baccetti, Manuela Mucedero, Paola Cozza


Treatment in the mixed dentition aimed to stop sucking habit and to improve the direction of growth of the palatal plane

QHX-Crib therapy stops thumbsucking in ALL subjects

The maxillary arch is expanded

The palatal plane rotates downward by 3° (vs unttx controls), assisting in the closure of the bite
If the canine does not erupt... when can it be defined as “impacted”?
1. Age of expected eruption

12 years 3 months in Females
13 years 1 month in Males

HURME V.:
Range of normalcy in the eruption of permanent teeth.
2. Absence of bulging at clinical palpation.

The absence of bulging has no diagnostic significance before 11 years of age

10 aa 29%
11 aa 5%
12 aa 3%

3. In cases of unilateral canine impaction, when the contralateral canine is fully erupted
4. Impaction or delayed eruption?

For impaction consider:
- fully erupted contralateral upper canine
- closed apex
- intraosseous malposition
1. Age of expected eruption

12 years 3 months in Females
13 years 1 month in Males

HURME V.:
Range of normalcy in the eruption of permanent teeth.
Individual Skeletal Maturation
Cervical Vertebral Maturation Method

The upper permanent canine can erupt
If unerupted = impacted

The Cervical Vertebral Maturation (CVM) Method for the Assessment of Optimal Treatment Timing in Dentofacial Orthopedics
Tiziano Baccetti, DDS, PhD, Lorenzo Franchi, DDS, PhD, and James A. McNamara Jr, DDS, PhD
(Seminars in Orthodontics 2005;11:119-129)
THE IMPACTED CANINE: SURGICAL APPROACH TO WARRANT LONGTERM PERIODONTAL HEALTH
The orthodontic traction is aimed to reproduce the physiologic eruption pattern.

“Tunnel Technique”
access the impacted canine through the socket of the deciduous canine (extracted concurrently), and pull the canine towards the center of the alveolar ridge (where the crown of the deciduous canine was present).
When the tunnel technique is not possible (the direction of traction is blocked by other teeth), or the deciduous canine is not there anymore, choose Closed Flap Approach for periodontal reasons.

Uncorrect guided eruption ("open" traction):
- Bad hygiene;
- Inadequate direction;
- Periodontal damage

Palatal
Tunnel traction of infraosseous impacted maxillary canines. A 3 year periodontal follow up.


**MM:** 15 pat. (13-17 y)
- 15 normally erupted canines - CONTROL
- 15 deep infraosseous canines (8 palatal – 7 buccal) - TEST
Results:

No significant difference of periodontal parameters between test and control teeth

- Phisiologic sulcus
- Adequate amount of gingiva
- Absence of recession
Treatment of impacted canine

**Success**: Tooth in a correct alignment in the dental arch associated with healthy periodontium
AIM: to compare the periodontal conditions - pocket depth (PD) and keratinized tissue width (KT) - of unilateral maxillary impacted canines treated by means of a combined surgical-orthodontic treatment (with direct traction to the center of the alveolar ridge) to those of normally erupted canines on the controlateral side.

125 patients with unilateral maxillary canine impaction

Periodontal evaluation was performed at the end of orthodontic treatment and at a follow-up (3.5 years)

Multilevel statistical analysis
No significant differences were found for Pocket Depth (PD) and Amount of Keratinized Tissue (KT) in the repositioned canines (test sites) compared with the untreated control sites.
Tunnel technique for Buccal Canine Impaction
Results Inferential statistics

- **α-angle**: every 5° of opening of the angle ➤ 1 more week of traction
- **d-distance**: every 1 mm of distance ➤ 1 more week of traction
- **s-sector**: impaction in sector 1 ➤ 6 more weeks of traction /sector 3
Factors of Success in Orthodontics and Dentofacial Orthopedics

Patient

1. Timing of Treatment: Individual Dentoskeletal Maturity
2. Responsiveness to Therapy
Factors of Success in Orthodontics and Dentofacial Orthopedics

2. Responsiveness to Therapy

Class II
Class III
Factors of Success in Orthodontics and Dentofacial Orthopedics

Patient

2. Responsiveness to Therapy

Class II
The amount of supplementary growth of the mandible when compared to untreated Class II controls varies widely among studies and within the same study as well....

INDIVIDUAL VARIABILITY IN THE RESPONSIVENESS TO FUNCTIONAL JAW ORTHOPEDICS (FJO)
Why different subjects with similar dentoskeletal Class II disharmony respond to FJO differently, even when treated at the RIGHT time (CS 3) ?

Search for anatomical factors for individual responsiveness to FJO
Prediction of individual mandibular changes induced by functional jaw orthopedics followed by fixed appliances in Class II patients.

Franchi L., Baccetti T.
The Angle Orthodontist, vol. 76, n.6, 950-4, 2006

57 SUBJECTS (28 f, 29 m)
Full Class II molar relationships
Treated with FJO followed by Fixed Appliances at the peak in mandibular growth (CS 3 at T1)

FJO Appliances:
17 TWIN-BLOCK (9 f, 8 m)
18 STAINLESS STEEL CROWN HERBST (12 f, 6 m)
22 ACRYLIC SPLINT HERBST (7 f, 15 m)

Time 1: 12 ys 2 mos ± 10 mos
Time 2: 14 ys 5 mos ± 11 mos
Time 2 – Time 1 changes were bi-annualized
DISCRIMINANT CEPHALOMETRIC VARIABLE TO BE ASSESSED BEFORE TX:

Co-Go-Me°

**Good Responders:** "Small" Co-Go-Me angle

**Bad Responders:** "Large" Co-Go-Me angle
GOOD RESPONDERS

Critical score 0.2525

BAD RESPONDERS

Co-Go-Me° at T1

Average 2ys Increase in Co-Gn

+7.3 mm  +6.8 mm  +4.2 mm

BEST RESPONDERS

GOOD RESPONDERS

BAD RESPONDERS
DISCRIMINANT VARIABLE: Co-Go-Me°

Bad Responders:
Co-Go-Me angle >128.5°

Classification Error: 23%

Measurement Error: 1.5°

Error in Discrimination: 20%

(Δ compliance, management of the appliance, intensity of hormonal factors at puberty, etc.)
DISCRIMINANT VARIABLE: Co-Go-Me°

Good Responders:

124° < Co-Go-Me angle <128.5°

Classification Error: 23%

Measurement Error: 1.5°

Error in Discrimination: 20%

(Δ compliance, management of the appliance, intensity of hormonal factors at puberty, etc.)
DISCRIMINANT VARIABLE:
Co-Go-Me°

Best Responders:
Co-Go-Me angle < 123°

Classification Error: 23%
Measurement Error: 1.5°
Error in Discrimination: 20%
(Δ compliance, management of the appliance, intensity of hormonal factors at puberty, etc.)
J.S., male. 12ys 9 mos

Skeletal maturity: CS 3

FH-Mand.Plane° = 29°
(reference standard 25°)

Co-Go-Me° = 125°

Good Responder
(range: 124° -128.5°)
J.S., male. 14ys 5 mos

Post-treatment observation
(TWB + Fixed Appliances: 18 mos)

Skeletal maturity: CS 5

Increase in Co-Gn (1y 8mos) = +10.3 mm
CS 3
Co-Go-Me = 118°
Best Responder to FJO!!

JM 11-3
Twin Block - modified design
Twin Block - modified design
Factors of Success in Orthodontics and Dentofacial Orthopedics

2. Responsiveness to Therapy

Class III
Is it possible to predict outcomes of orthopedic treatment of Class III malocclusion in the individual patient?
Cephalometric Variables Predicting the Long-Term Success or Failure of Combined Rapid Maxillary Expansion and Facial Mask Therapy

Tiziano Baccetti, DDS, PhD, Lorenzo Franchi, DDS, PhD, and James A McNamara, DDS, PhD
Firenze, Italy and Ann Arbor, Michigan

(Am J Orthod Dentofac Orthop 2004;126:16-22)
AIM

To select a model of cephalometric predictive variables for the outcome of early treatment of Class III malocclusion with RME and facial mask.
42 subjects
19 males, 23 females

Skeletal and dental Class III

1st OBSERVATION:
8 ys 6 mos ± 2 ys (before pubertal peak – CS 1 or 2)

Therapy: RME & FM + fixed appliances

2nd OBSERVATION:
15 ys ± 1y 10 mos (after the peak – CS 5 or 6)
Permanent Dentition (after Treatment)

Class III Occlusal Signs in the Permanent Dentition (after Treatment)
- anterior cross-bite (at least one incisor)
- Class III permanent canine relationship
- Class III permanent molar relationship

Time 2
Assessment of Outcome of Treatment

"success" → SUCCESSFUL GROUP (SG) = 30 subjects

"failure" → UNSUCCESSFUL GROUP (USG) = 12 subjects

(42 subjects)
Stable Basicranial Line (SBL)
Line traced through the most superior point of the anterior wall of sella turcica at the junction with the tuberculum sellae (point T) and the Fronto-Maxillo-Nasal point (FMN)

Vertical T (VertT)
Line perpendicular to SBL through point T
Cephalometric Analysis (1st observation)

A-VertT \( \text{mm} \)
B-VertT \( \text{mm} \)
Pg-VertT \( \text{mm} \)
Co-VertT \( \text{mm} \)
Co-Pg \( \text{mm} \)
Co-Goi \( \text{mm} \)
Goi-Pg \( \text{mm} \)
Ar-Goi-Me \( \degree \)
Mand P.-SBL \( \degree \)
Pal P.-SBL \( \degree \)
Pal P.-Mand.P. \( \degree \)
Ba-T-SBL \( \degree \)
Ar-T-SBL \( \degree \)
CondAx-SBL \( \degree \)
CondAx-MandP. \( \degree \)
Wits \( \text{mm} \)
Molar Rel. \( \text{mm} \)
Overbite \( \text{mm} \)
Overjet \( \text{mm} \)
DISCRIMINANT MEASUREMENTS BETWEEN SUCCESSFUL AND FAILURE GROUPS

1. Co-Goi mm
2. Ba-T-SBL °

ON THE PRE-TX CEPH (age 6-10)
SUCCESSFUL CASES

↓ Co-Goi mm

↓ Ba-T-SBL °

↓ Mand. P.-SBL °
UNSUCCESSFUL CASES

↑ Co-Goi mm

↑ Ba-T-SBL °

↑ Mand. P.-SBL °
PREDICTIVE POWER OF THE THREE MEASUREMENTS

84 %
Procedure

\[
\begin{align*}
\text{Co-Goi} & \times 0.3 \ + \\
\text{Ba-T-SBL} & \times 0.2 \ + \\
\text{Mand.P.-SBL} & \times 0.1 \ =
\end{align*}
\]

Individual Score
Each new Class III patient at CS 1 (6-10 ys) that will show an individual score *smaller* than the critical score can be predicted to *respond well* to early orthopedic treatment.

Prediction Power = 84%
Prognosis in Early Class III Malocclusion

Each new Class III patient at CS 1 (6-10 ys) that will show an individual score greater than the critical score can be predicted to respond poorly to early orthopedic treatment

Prediction Power = 84%
P.S. ♂
7 ys
CS 1
P.S.  
7ys (CS 1)

Coefficients

Co-Goi (50.3 mm x 0.3) +
Ba-T-SBL (66.0° x 0.2 ) +
Mand P. -SBL (29.2° x 0.1 ) =

INDIVIDUAL SCORE 32.0

Critical Score 30

PREDICTION : FAILURE of EARLY TREATMENT
Critical value

SUCCESS       FAILURE

P.S.
P.S. ♀
16 ys
CS 5
Is it possible to predict outcomes of orthopedic treatment of Class III malocclusion?

YES

with a probability of error in 1 out of 6 cases
(as confirmed by the analysis on a different sample of 12 Class III subjects)
Factors of Success in Orthodontics and Dentofacial Orthopedics

Patient

1. Timing of Treatment: Individual Dentoskeletal Maturity
2. Responsiveness to Therapy
3. Specific Treatment Indications
Treatment of Class II Malocclusion

- **Functional Appliances**
  - + Fixed Appliances
  - 60-70% of Treated Class IIs

- **Headgear**
  - + Fixed Appliances and Class II elastics
  - 20% of Treated Class IIs

...just a matter of choice, or......
Treatment of Class II Malocclusion
“State of the Art” - 2009

1. Functional Jaw Orthopedics (5-15% of Class II tx protocols) produces the best and most stable outcomes when performed at the peak (or postpeak) growth periods.

2. Twin Block and Herbst are the most effective and efficient appliances for FJO; the Herbst can be used in young adults.

3. Headgear + Fixed appliances + Class II Elastics (> 70% of Class II tx protocols) produce similar outcomes when used at the peak growth period, similarly to FJO. They are all “Phase 2” treatments.

4. Both FJO and Headgear protocols induce changes in the maxilla, mandible, and dentoalveolar regions.

FJO and Headgear Protocols show more similarities than differences.
Can we identify “ideal candidates” for FJO?

When should FJO be preferred to Headgear?
Comparison of Two Comprehensive Treatment Protocols for Class II Malocclusion including the Bonded Herbst and the Headgear Appliances: A Double-Blind Study on Consecutively-treated Patients at Puberty

Tiziano Baccetti, Lorenzo Franchi, Franka Stahl


Bonded Herbst + Fixed Appliances

VS

Headgear + Fixed Appliances and Class II elastics
SUBJECTS AND METHODS:

Fifty-six Class II patients were enrolled in the trial and allocated by personal choice to 2 practices where they underwent one of the 2 treatment protocols.

28 patients were treated consecutively with BH+FA, and 28 patients consecutively with HG+FA.
SUBJECTS AND METHODS:

All patients in both groups started treatment at puberty (CS 3 or CS 4), and completed treatment at an advanced post-pubertal stage in skeletal development (CS 5 or CS 6).

Lateral cephalograms were taken in all subjects before therapy (T1) and at an average interval of 6 months after the completion of comprehensive therapy (T2).
Longitudinal observations on a matched group of 28 subjects with untreated Class II malocclusion were compared with the 2 treated groups to derive information about effectiveness of treatment protocols for the correction of the disharmony.

ANOVA with post-hoc tests was used for statistical comparisons.
## Demographics

<table>
<thead>
<tr>
<th></th>
<th>Age at T1</th>
<th>Age at T2</th>
<th>T1-T2 interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td><strong>HG+FA</strong> (n=28, 14f 14m)</td>
<td>13.0</td>
<td>1.2</td>
<td>15.7</td>
</tr>
<tr>
<td>CS3 or CS4 at T1; CS5 or CS6 at T2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BH+FA</strong> (n=28 14f 14m)</td>
<td>13.0</td>
<td>0.8</td>
<td>15.7</td>
</tr>
<tr>
<td>CS3 or CS4 at T1; CS5 or CS6 at T2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Controls</strong> (n=28, 14f 14m)</td>
<td>12.9</td>
<td>1.3</td>
<td>15.6</td>
</tr>
<tr>
<td>CS3 or CS4 at T1; CS5 or CS6 at T2</td>
<td></td>
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</tr>
</tbody>
</table>
SUCCESS RATE:

92.8% in both BH+FA and HG+FA groups (26 out of 28 patients)
Analysis of occlusal correction:

<table>
<thead>
<tr>
<th></th>
<th>BH+FA</th>
<th>HG+FA</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVJ</td>
<td>-3.7 mm</td>
<td>-3.2 mm</td>
</tr>
<tr>
<td>Molar Relation</td>
<td>3.8 mm</td>
<td>4.2 mm</td>
</tr>
</tbody>
</table>

Significant dento-alveolar changes more marked in the HG+FA group:

- retroclination of upper incisors
- proclination of lower incisors
- extrusion and mesial movement of lower molars
Sagittal Changes in the Maxilla “PtA-NPerp”

**BH+FA**

-1.0

**HG+FA**

-0.6

Difference Treated-Controls

-1.5 *

Difference Treated-Controls

-1.1 *
Sagittal Changes in the Mandible

“Co-Gn”

BH+FA

8.1

Difference Treated-Controls
+ 2.9 **

HG+FA

7.2

Difference Treated-Controls
+ 2.0 *
Sagittal Changes in the Mandible
“Pg-NPerp”

Difference Treated-Controls

BH+FA

HG+FA

Treated-Controls

+ 1.9 **

+ 0.4 ns

0.8

1.2

2.7
Soft Tissue Analysis

from Arnett et al., modified
Sagittal Changes in the Chin Profile
“Pg-NPerp”

Bonded Herbst +FA

Headgear +FA

Difference
Treated Controls
+ 2.5 **

Difference
Treated Controls
+ 0.7 ns
Can we identify preferential candidates for the Bonded Herbst+FA protocol on the basis of the changes in the profile (advancement of chin soft tissues)?
2 Pre-Treatment Cephalometric Variables Are Significantly Useful to Identify Ideal Candidates for Functional Jaw Orthopedics (BH+FA)
2 Pre-Treatment Cephalometric Variables Are Significantly Useful to Identify Ideal Candidates for Functional Jaw Orthopedics (BH+FA)

The smaller Co-Go-Me angle, the more indicated is FJO vs Headgear therapy (ideally Co-Go-Me < 123°)
2 Pre-Treatment Cephalometric Variables Are Significantly Useful to Identify Ideal Candidates for Functional Jaw Orthopedics (BH+FA)

The larger Pg-Nperp, the more indicated is FJO vs Headgear therapy (ideally Pg-Nperp > 7 mm)
“Ideal Candidates” for FJO

Class II patients at the pubertal growth spurt with severe mandibular retrusion (affecting the profile), and with a small mandibular angle
Treatment of Class II Malocclusion

Functional Appliances + Fixed Appliances

Headgear + Fixed Appliances and Class II elastics

...not just a matter of choice, rather a matter of indications!
V.E. female, 14 ys

Courtesy of Dr. R. Cortesi - Dr. R. Ferro
Ideal Candidate for a Functional Appliance
Therapeutical Choice:

Fixed Appliances + Headgear + Class II Elastics
Treatment Duration: 2 years

V.E., 16 years
CS 4 (pubertal peak)  

Pre-Treatment  

12y2m

CoGoMe $= 120^\circ$

Post-Treatment

14y 2m

PgNPerp $= 9$ mm

CS 6 (completion of active growth)
C.M. female
14y 2m

Duration of comprehensive One-Phase Treatment
(Herbst 10 mos + fixed appliances 1y2mos): 2 years
Treatment of Class III Malocclusion

When it comes to indications...

The Weird Story of the Face Mask in Orthodontics
LOGICAL DEVELOPMENT OF CLINICAL INDICATIONS FOR A TREATMENT PROTOCOL

Tx protocol conceived to correct a clinical problem

Application of the protocol on patients showing the clinical problem

Validation of the original indication

Evaluation of significant effects (mechanisms of correction)

SCIENTIFIC TESTING

“New” clinical indications

Identification of “unexpected” favorable effects

Not valid
The Weird Story of the Face Mask in Orthodontics (1)

Delaire J.

Maxillary growth: therapeutic conclusions


Fig. 5. Divers mouvements du maxillaire, générateur de croissance:
(1) déplacement en avant de son point d’implantation supérieur,
(2) bascule autour de cette implantation,
(3) abaissement de la partie postérieure du palais,
(4) modifications verticales et antéro-postérieures de l’arcade alvéolo-dentaire,
(5) orientation particulière de l’os incisif,
(6) expansion du sinus maxillaire.
LOGICAL DEVELOPMENT OF CLINICAL INDICATIONS FOR A TREATMENT PROTOCOL

Tx protocol conceived to correct a clinical problem

Application of the protocol on patients showing the clinical problem

Validation of the original indication

SCIENTIFIC TESTING

“New” clinical indications

Identification of “unexpected” favorable effects

Evaluation of significant effects (mechanisms of correction)

Not valid
Face Mask conceived to correct Class III due to Maxillary Retrusion

Application of the face mask on Class III patients with Maxillary Retrusion

Validation of the original indication

Evaluation of significant effects (mechanisms of correction)

Identification of “unexpected” favorable effects

“New” clinical indications

Not valid
Following the original presentation of the appliance by Jean Delaire, the Face Mask was consistently used in subjects with *Class III malocclusion due to Maxillary Retrusion or Deficiency* ........
The Weird Story of the Face Mask in Orthodontics (3)

...moreover, clinical investigations on the dentoskeletal effects of the Face Mask focused on the Maxilla only ........


The Weird Story of the Face Mask in Orthodontics (4)

Long-term effects of Class III treatment with rapid maxillary expansion and facemask therapy followed by fixed appliances

Patricia Vetlesen Westwood, DDS, MS\textsuperscript{a}, James A. McNamara, Jr., DDS, PhD\textsuperscript{b}, Tiziano Baccetti, DDS, PhD\textsuperscript{c}, Lorenzo Franchi, DDS, PhD\textsuperscript{d}, David M. Sarver, DMD, MS\textsuperscript{e}

Treated Group vs. Control Group Long-Term

- Favorable skeletal changes were found to be GREATER in the mandible than in the maxilla !!!

- Significant dento-alveolar effects
- No posterior rotation of the mandible
LOGICAL DEVELOPMENT OF CLINICAL INDICATIONS FOR A TREATMENT PROTOCOL

1. Tx protocol conceived to correct a clinical problem
2. Application of the protocol on patients showing the clinical problem
3. Validation of the original indication
4. Scientific testing
   - Evaluation of significant effects (mechanisms of correction)
5. Identification of “unexpected” favorable effects
6. “New” clinical indications
7. Not valid
LOGICAL DEVELOPMENT OF CLINICAL INDICATIONS FOR A TREATMENT PROTOCOL

Face Mask conceived to correct Class III due to Maxillary Retrusion

Application of the face mask on Class III patients with Maxillary Retrusion

Validation of the original indication

“New” clinical indication: Class III Malocclusion due to Mandibular Protrusion

Evaluation of significant effects (mechanisms of correction)

SCIENTIFIC TESTING
Factors of Success in Orthodontics and Dentofacial Orthopedics

1. Timing of Treatment: Individual Dentoskeletal Maturity
2. Responsiveness to Therapy
3. Specific Treatment Indications
Factors of Success in Orthodontics and Dentofacial Orthopedics

Patient

Treatment
Factors of Success in Orthodontics and Dentofacial Orthopedics

Treatment

1. Class II treatment protocols
Functional Appliances
Construction Bite

• No universal rule

Recommended mandibular advancement:

1. “Incisors End-To-End”
2. “Step-by-step”
3. “70% Rule”
SUGGESTED CLINICAL RULES

(McNamara)

Mandibular advancement:
- Overjet < 7-8 mm: End-To-End
- Overjet > 7-8 mm: 50% OVJ and then 100% OVJ


Stepwise advancement provides better stimulation of condylar growth
Projet™ Bite Fork
(Ortho-care UK)
Use YELLOW or WHITE Projet™ Bite Fork (4 mm thickness)
Adaptation of the wax on the fork
TOTAL THICKNESS MUST EXCEED
VERTICAL FREEWAY SPACE BY AT LEATS 2 MM
(total thickness at least 7 mm for the Twin Block)
Adaptation of the Projet
Construction bite
Which functional appliances are more effective and which are more efficient?

**TWINBLOCK: HIGH EFFECTIVENESS AND EFFICIENCY**
- Supplementary mandibular elongation = 3.4 mm
- Average treatment duration = 13 months
- Coefficient of efficiency = 0.26 mm/mo

**HERBST: HIGH EFFECTIVENESS AND EFFICIENCY**
- Supplementary mandibular elongation = 3.0 mm
- Average treatment duration = 10 months
- Coefficient of efficiency = 0.28 mm/mo

**ACTIVATOR : MEDIUM EFFECTIVENESS AND EFFICIENCY**
- Supplementary mandibular elongation = 2.7 mm
- Average treatment duration = 18 months
- Coefficient of efficiency = 0.17 mm/mo

**FR-2: LOW EFFECTIVENESS AND EFFICIENCY**
- Supplementary mandibular elongation = 2.0 mm
- Average treatment duration = 23 months
- Coefficient of efficiency = 0.09 mm/mo
HERBST: EXTENDED TREATMENT TIMING

Minor mandibular effect / Major dentoalveolar changes
GOALS of TX:
- Max Expansion
- Upper Molar Derotation
- Correction of Open Bite
- Class II Correction
Crown Herbst + Fixed Appliances
Crown Herbst + Fixed Appliances

AF 20-5
In Deep-Bite Class II Cases:

1. Eliminate the interference due to the excessive OVJ

2. Advance the mandible
To improve Patient’s Compliance and increase Predictable Results:

Use compliance-free devices: *Herbst, Forsus*

or

Bond removable appliances: *Twin Block*
The MAGNOGLIDE

M. Ali Darendeliler, University of Sydney
The MAGNOGLIDE

Features
The MAGNOGLIDE

How it works - SAGITALLY

3 Magnetic Force Vectors
- 1 Repulsing
- 2 Attracting

CENTRIC OCCLUSION  PROTRUSIVE OCCLUSION
The MAGNOGLIDE

How it works - SAGITTALLY

3 Magnetic Force Vectors
- 1 Repulsing
- 2 Attracting

CENTRIC OCCLUSION

PROTRUSIVE OCCLUSION
Genevieve B.  11 - 9  M. Foo, M. Ali Darendeliler, University of Sydney
Genevieve BK 11y 9m

Lateral ceph T1

CS 3

M. Foo, M. Ali Darendeliler, University of Sydney
MAGNOGLIDE

15 months

Genevieve B.
MAGNOGLIDE

20 months

Genevieve B.  M. Foo, M. Ali Darendeliler, University of Sydney
MAGNOGLIDE

SUPERIMPOSITION

T1-T2 = 20 mos

Only

1 mm

of advancement

of the maxilla

10 mm

of increase

in mandibular

length!

Genevieve B.
2 fundamental adjuncts to Class II treatment:

- RME
- Molar derotation
Sagittal advancement of the mandible during the retention phase after RME (6 to 12 months)

Improvement in molar relation = 1.7 mm

Guest et al., 2009, AJO/DO in press
A.B., 7.5 ys
“Mild” Class II malocclusion
Transverse discrepancy = - 4.5 mm
A.B., 9.5 ys

Correction of the “mild” Class II following RME (due to mandibular advancement, not to leeway space)
Class II Molar relationship as assessed from a vestibular view may be the result (at least in part) of mesial molar rotation on the horizontal plane.
Molar Derotation (may correct “Mild” Class II)

“Buccal cusps angulation”

McNamara and Brudon, 2001

% of Molar Rotation:

Class II subjects: 84% (101 of 120 subjects)
Class I subjects: 36% (18 of 58 subjects)
Average amount of molar rotation in Class II: 16.5 deg

Every 10 degrees of molar derotation correspond to 1 mm of distalization of the buccal cusps of the molar

Molar Derotation provides 1 to 2 mm of molar correction, along with an increase in arch perimeter
Factors of Success in Orthodontics and Dentofacial Orthopedics

Treatment

1. Class II treatment protocols
2. Class III treatment protocols (RME/FM)
Facial Mask

SEQUENTIAL USE OF ELASTICS:
• Bilateral 3/8”  200 g
• Bilateral 1/2”  500 g
• Bilateral 5/16”  500 g

Forward-downward direction of extra-oral elastics

Full-time wear until overjet is overcorrected (4 to 5 mm)
Nighttime wear for an additional 3- to 6-month-period
Facial Mask Therapy

Petit's facial mask
Facial Mask of Petit
Skeletal response to maxillary protraction with and without maxillary expansion: A finite element study

Pawan Gautam, Achima Veliathan, and Raviraj Adhikar
Munipal, Karnataka, India

500 grams/side; 30° downward to the palatal plane

Fig 2. Maxillary protraction alone, causing counter-clockwise rotation of the nasomaxillary complex.

Fig 3. Maxillary protraction with maxillary expansion (lateral view), causing the nasomaxillary complex to translate anteroinferiorly, approximating its growth direction.
after protraction with the FM

> 5 mm !!!
Long-term effects of Class III treatment with rapid maxillary expansion and facemask therapy followed by fixed appliances

Patricia Vetlesen Westwood, DDS, MS\textsuperscript{a}, James A. McNamara, Jr, DDS, PhD\textsuperscript{b}, Tiziano Baccetti, DDS, PhD\textsuperscript{c}, Lorenzo Franchi, DDS, PhD\textsuperscript{d}, David M. Sarver, DMD, MS\textsuperscript{e}


“...all the Class III patients whose overjet had been corrected to 4 mm or more at the end of active treatment with RME and FM, were those who remained stable after puberty.”
Factors of Success in Orthodontics and Dentofacial Orthopedics

Treatment

1. Class II treatment protocols
2. Class III treatment protocols (RME/FM)
3. Fixed appliances: rational use of friction
Low-friction Biomechanics

Non-conventional bracket systems (self-ligating brackets)
REQUISITES FOR IDEAL LOW-FRICTION SYSTEMS

- Low cost

- VERSATILE SYSTEM:
  • Low-friction only for leveling and aligning phase
  • Different friction levels in different parts of the dental arch during leveling and aligning
  • Low-friction for sliding mechanics during space closure
  • High-friction in finishing phase (full expression of bkt information)

- Easy clinical management

- Patient’s comfort
Low-friction Biomechanics
VALID ALTERNATIVE

Conventional bracket system + non-conventional ligature combinations
Rational use of friction and low-friction
We are the choices we make
Factors of Success in Orthodontics and Dentofacial Orthopedics

Treatment

1. Class II treatment protocols
2. Class III treatment protocols (RME/FM)
3. Fixed appliances: rational use of friction
4. Retention issues
New Era of Digital Imaging

Low-Dose TC Cone-Beam Rx
Immediate and post-retention effects of rapid maxillary expansion investigated by computed tomography in growing patients.

Ballanti F, Lione R, Fanucci E, Franchi L, Baccetti T, Cozza P.


17 subjects (7 males and 10 females) mean age at first observation of 11 years (all PREPUBERTAL !!)

Each patient underwent expansion of 7mm.

Multi-slices CT scans were taken before rapid palatal expansion (T0), at the end of the active expansion phase (T1), and after a retention period of six months (T2).

RME therapy followed by 5 months of retention induces a significant increase in the transverse dimension of the maxilla without permanent injuries to the periodontal bony support of anchoring teeth.

LEAVE RME IN PLACE FOR AT LEAST 5 MONTHS!!
CLASS III MALOCCLUSION
TREATMENT PROTOCOL

1) Rapid maxillary expansion with a bonded acrylic splint expander with vestibular hooks

2) Orthopedic protraction of the maxilla with facial mask

3) Retention with the Mandibular Removable Retractor
RETENTION WITH THE REMOVABLE MANDIBULAR RETRACTOR followed by FIXED APPLIANCES to refine occlusion
Typical Orthopedic Protocol for Class III Malocclusion

1. **RME:** one week of screw activations, 1 activation/day
   in case of absence of transverse interarch discrepancy
   hypercorrection of transverse interarch relationships
   in case of presence of transverse discrepancy
   (usually 3 to 5 weeks)

2. **Face mask:** delivered the last day of RME activation
   from 6 to 8 mos of fulltime wear (16h /day) until ovd>4mm

3. **Face mask:** additional 4 to 6 mos of nighttime wear

4. **Removable mandibular retractor:** 1 or 2 years *, 14h /day

5. **Fixed appliances:** to refine occlusion (Class III elastics can be added)
The interval CS3-CS4 (growth spurt) lasts 6 months longer in Class III vs Class I!!
Retention after fixed appliances (in patients with crowding)

2 golden rules:

- Use stripping when/where indicated
- Place contact points correctly
Incisors of triangular shape
Premolars of ovoidal shape
Place distal contact point of lateral incisors **EXTERNAL** to the mesial contact point of the canine

Zachrisson ’97
Factors of Success in Orthodontics and Dentofacial Orthopedics

Patient

1. Timing of Treatment: Individual Dentoskeletal Maturity
2. Responsiveness to Therapy
3. Specific Treatment Indications
Factors of Success in Orthodontics and Dentofacial Orthopedics

1. Class II treatment protocols
2. Class III treatment protocols (RME/FM)
3. Fixed appliances: rational use of friction
4. Retention issues
Success is Mainly in the **Brain** *(Knowledge)*
and in the **Heart** *(Passion)*
rather than in the Hand *(Technique)*