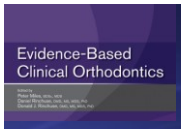
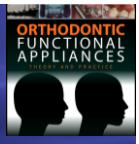
Evidence-based efficiency in Class II treatment

Peter Miles

Resources





- Evidence-Based Clinical Orthodontics - Quintessence
- Amazon or Download on iTunes
- Orthodontic Functional Appliances: Theory and Practice - Wiley
- Newwaveorthodontics.blogspot.com.au

Peter Miles

Expansion stimulates growth?

- Guest, McNamara et al. AJODO 2010;138:582-91
- 50 Class II subjects with RME. Some also had partial braces or a lower Schwarz expander.
- Compared with literature control group
- "The protocol ... can help to improve the Class II malocclusion as a side-effect."
- "The results of this study show that the improvements are far more pervasive than anticipated."

Peter Miles

Expansion stimulates growth?

- Molar 6/6 — 1.7mm
- Co-Gn — 1.3mm
- Overjet — 1mm

Peter Miles

Expansion stimulates growth?

- Historical control so less valid comparison
- No blinding so risk of bias

CVM stage	RME group (19 boys, 31 girls) Subjects at T2 (n)	Control group (28 boys, 22 girls) Subjects at T2 (n)
1	5	3
2	14	10
3	13	11
4	7	17
5	9	9
6	2	0

RME group have more potential for growth

Systematic review

- Lagravere et al. Angle 2005;75:1046–1052
- No significant alterations in A-P were found in any of the studies reviewed.
- After the posttreatment and postretention, the maxilla and mandible of the treated groups presented no statistical or clinical significance.

Peter Miles

Expansion stimulates growth?

- Volk et al. AJODO 2010;137:310-5
- Small retrospective study of 13 Class II subjects who underwent expansion and then observation
- 7 of the 13 subjects underwent improvement
- 5 of the remaining subjects actually got worse
- The authors concluded their results do not support the 'foot in the shoe' theory and that maxillary expansion does not predictably improve Class II dental relationships.

Peter Miles

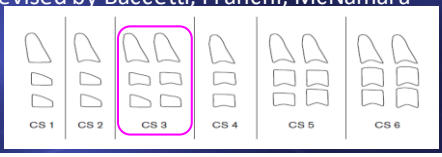
Timing of Class II treatment

- Initially many felt that functional appliance therapy should be initiated at ~9-10 yo
- Cochrane Review showed early treatment made no difference in the final outcome
- Others have suggested timing to peak growth spurt for the greatest skeletal effect (~12-13)

Peter Miles

Timing of treatment

- CVM – Cervical Vertebral Maturation method
- Based on Don Lamparski's thesis from U Pitt
- Revised by Baccetti, Franchi, McNamara



CVM method

- The age closest to this stage varies greatly, from 8½ - 11y 5m in girls and 10-14 in boys
- This large variability makes it more difficult to determine the ideal timing for treatment for an individual, and multiple radiographs may be required to determine this

Peter Miles

Is the CVM method reliable?

- AJODO 2009;136:478.e1–478.e7
- 10 orthodontists assessing radiographs
- Inter-observer agreement <50%
- Intra-observer agreement = 62%
- AJODO 2011;139:e455–e461
- **The CVM method cannot predict the onset of peak mandibular growth**

Peter Miles

CVM and skeletal growth

- AJODO 2013;144:838-47. Beit et al.
- 730 subjects from a growth study had radiographs analysed by CVM, hand-wrist films graded and chronological age
- **CVM offers no advantage over chronological age in assessing or predicting the pubertal growth spurt**

Peter Miles

CVM and mandibular growth

- AJODO 2016;149:92-8.
- Gray et al.
- **"Morphometric changes of the cervical vertebrae and the CVM method could not accurately identify the mandibular growth peak."**

Peter Miles

The title says it all!

- Eur J Orthod 2016;38 (1): 1-7
- Engel et al.
- **"The cervical vertebrae maturation (CVM) method cannot predict craniofacial growth in girls with Class II malocclusion"**

Peter Miles

Herbst and CVM

- A Herbst used at the ideal time according to the CVM method resulted in 1.9mm advancement of Pogonion AJODO 2009;135:698.e1–698.e10
- A Herbst used in non-growing adult patients resulted in a 1.3mm advancement of Pogonion AJODO 2004;126:140–152
- Is it worth 0.6mm?

CS 3

Herbst vs. elastics

- Class II correction in patients treated with Cl2 elastics and with fixed functional appliances: ....
- Nelson et al. AJODO 2000;118:142-9.
- 18 Begg/elastics for 1.3 years
- 18 Herbst only for 0.5 years
- Skeletal improvement in Herbst 2mm better
- OJ improvement in Begg was 2mm better
- Skeletal contribution 4% in Begg, 51% in Herbst

Peter Miles

Herbst vs. Elastics – long term?

- Nelson et al. AJODO 2007;132:499-503.
- 15 from each group returned ~6-8 years later
- During the total observation period many of the changes reversed and the differences did not last
- **The final outcome may be similar regardless**

Peter Miles

Systematic review of elastics

- Janson et al. AJODO 2013:143:383-92.
- Class II elastics are effective in correcting Class II malocclusions and their effects are primarily dentoalveolar
- Therefore, they are similar to functional appliances in the long-term.

Peter Miles

What is a functional appliance?

- "One that engages both dental arches and acts principally by holding the mandible away from its normal resting position" (Isaacson et al. 1990)
- "An appliance aimed at modifying growth" (Proffit 2007)

Peter Miles

Fixed Class II correctors

- The current convention is Fixed Functional Appliances (FFA)
- The more appropriate description is Fixed Class II Correctors

Peter Miles

Popularity of FC2C - USA

APPLIANCE	2002	2014
Pendulum	13%	5%
Distal-jet	2%	2%
Herbst	35%	23%
MARA	3%	5%
Forsus	2%	26%

Peter Miles

Popularity of FC2C - Australia

APPLIANCE	2013
Twin Block	70%
Pendulum, Distal-jet	11%
Herbst	33%
Forsus, Jasper Jumper	61%
MARA	0%

Peter Miles

Forsus FRD vs. elastics

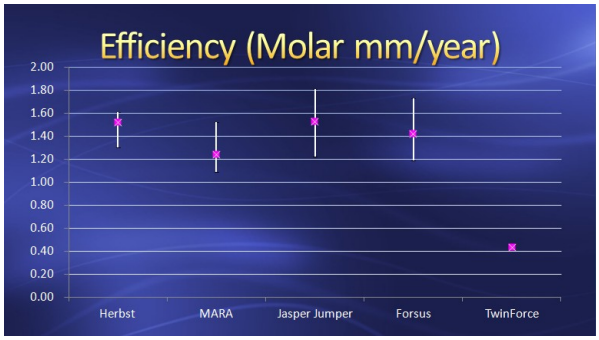
- Class II Non-Extraction Patients Treated with the Forsus Fatigue Resistant Device Versus Intermaxillary Elastics.
- Jones G et al. Angle Orthod 2008;78:332–338.
- With the exception of lower molar mesial movements and total molar correction, which were significantly ($P < .05$) greater in the Forsus group, there were no statistically significant group differences in the treatment changes. (retro/matched)

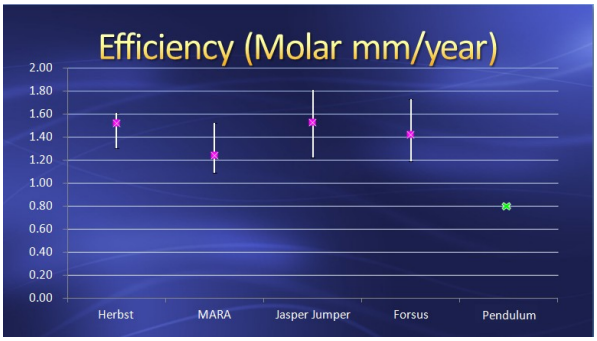
Peter Miles

Forsus success

- Effectiveness of comprehensive fixed appliance Tx used with the Forsus FRD in Cl2 patients
- Franchi, Alvetro et al. Angle 2011;81:678-683
- 32 subjects compared with matched control
- 87.5% success rate with Tx over 2.4 yrs (± 0.4)
- Overjet reduced ~5.5mm, molar relationship 3.4mm, lower incisors flared ~5°

Peter Miles





Summation

- Treatment times and molar effects are similar except for Twinforce and distalisers
- However, this does not factor in the number of appointments, appointment duration, or appliance cost which influence the cost effectiveness
- Ideally this would be the subject of future high quality RCT's

Peter Miles

Survey of extractions

- JCO 2014 – USA

TABLE 14
EXTRACTIONS

	2014	2008	1996	1986
Treated at least one extraction case	99%	95%	92%	95%
Percentage of active cases (median)	15	18	22	35

- Australian Orthodontic Journal – 2013
- 23%

Peter Miles

Borderline extraction cases

- Paquette et al. AJODO 1992;102:1-14
- 33 xtn and 30 non-xtn matched 'Borderline' cases
- Cases treated between 1969 – 1980 when the extraction rate was significantly higher
- Irregularity index of 5-6.5mm
- The extraction patients proved as likely to view their outcome as an improvement as did their non-extraction cohorts

Peter Miles

Effect of xtn upper 1st Bi's on the lip

- Aust Orthod J. 2006;22:31-7. Bokas, Collett
- 35 Class II div 1 patients OJ ≥ 5 mm (12 ≥ 9mm)
- Upper first premolar extractions only
- Upper lip was 0.5 mm less protrusive
- OJ ≥ 9mm - upper lip was ~1 mm less protrusive

Peter Miles

Class II – extraction vs. non

- Class II treatment efficiency in maxillary premolar extraction and nonextraction protocols
- G Janson et al. AJODFO 2007;132:490-498

- The 2-maxillary-premolar-extraction protocol has greater treatment efficiency than the non-extraction protocol of complete Class II malocclusion.

Peter Miles

Canine vs. en masse retraction?

- Heo W et al. Angle Orthod. 2007;77:973-8
- 30 Women – 2 groups of 15 matched cases
- Approximately 4 mm of the retraction of the upper incisal edges resulted from 1 mm of anchorage loss in the upper molars in both groups.
- Conclusion: No significant differences existed in the degree of anchorage loss.

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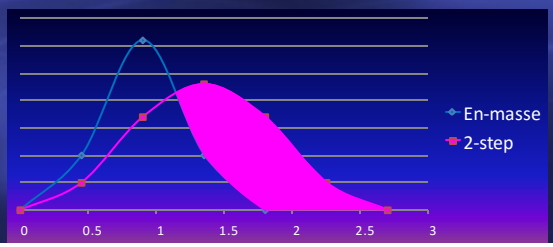
Rate of space closure



En-Masse sliding mechanics

- P Miles. *AJODO* 2007;132:223-5
- Split mouth study comparing SmartClip with CB using en-masse retraction on a posted 0.016"x0.022" ss wire in 0.018" slot with SS ligatures used on CB

- Results: no difference in the rate of space closure p=0.86

- CB = 1.2mm/mth, SC 1.1mm/mth

Peter Miles

Canine retraction

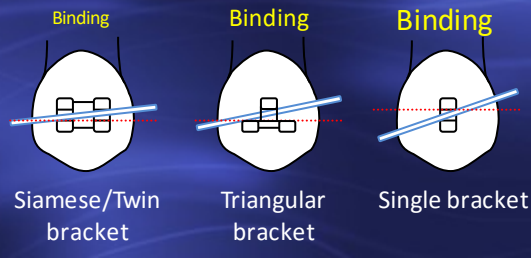
- S Burrow. *Angle Orthod* 2010;80:626-633.
- Split mouth study on 43 subjects comparing SmartClip & Damon3 with a CB during canine retraction on a 0.018" ss wire in 0.022" slot using 150g springs

- Results: Statistically significant difference in the rate of retraction (SC p<0.0043; D3 p<0.0001)

- CB = 1.2mm/mth, SC = 1.1mm/mth, D3 = 0.9mm/mth

Peter Miles

Bracket width, tip control & binding



Tipping vs. bodily retraction

- Shpack N et al. Angle Orthod 2008;78:95-100
- 14 subjects, 22 slot, split mouth, xtn Mx 1st Bi's
- Bodily retraction was faster than tipping due to less time root uprighting.
- Anchorage loss was similar for both groups (17-20% or 1.2-1.4mm)

Peter Miles

En-masse vs. Canine

- Miles
- CB = 1.2mm/mth
- SC = 1.1mm/mth

- Burrow
- CB = 1.2mm/mth
- SC = 1.1mm/mth

Peter Miles

TADs/En-masse vs. TPA/2-step

- Eur J Orth 2014;36:275-283.
- RCT of TADs & en-masse vs. TPA & 2-step
- 56 Class II Div 1 randomised to each group

Group	Molars (mm)	Tx Time (mths)
TAD/En-masse	-0.89	12.9
TPA/2-step	1.5	17.0

Peter Miles

Burstone on retraction

- Burstone CJ. Am J Orthod 1982;82:361–378.
- Separating the retraction of canines from that of the incisors makes little sense because all six teeth can be retracted at once with relatively low forces
- **The only patients for whom separate canine retraction is appropriate are those with anterior crowding as a result of archlength problems.**

Peter Miles

Ligatures, modules, SL brackets?

- Wong et al. J Orth 2013;40:155-162.
- 45 subjects with 1st Bi's xtn – 0.022" slot – RCT
  - Conventional elastomeric modules
  - SuperSlick 'low-friction' elastomeric ligatures
  - Damon 3MX®
- No difference in rate of closure (p=0.72)
- 1mm per 28 days but a lot of variation

Peter Miles

AcceleDent during space closure

- Peter Miles, Liz Fisher
- RCT of 40 Class II upper bicuspid extraction cases
- 37 of 40 with data (power analysis only need 7)
- Space closure
  - Expt = 0.32mm/wk
  - Control = 0.30mm/wk (P=0.74)

Peter Miles