FEATURES SECTION

Evidence-based orthodontics

J. E. Harrison
Liverpool University Dental Hospital, UK

***American Journal of Orthodontics and Dentofacial Orthopedics* 2003; 123: 117–126**

Incisor trauma and early treatment for Class II division 1 malocclusion
Koroluk DL, Tulloch JFC, Phillips C

Objectives: To compare the prevalence and severity of incisor trauma, incidence and expected costs of trauma in patients with large overjets, whose orthodontic treatment was started in the mixed or permanent dentition.

Design: A randomized controlled trial.

Setting: North Carolina, USA.

Participants: One hundred and seventy nine patients, of which 163 had complete trauma data and completed Phase 1 and 139 had completed Phase 2.

Interventions: Phase 1—observation only; growth modification with functional appliance or headgear. *Phase 2*—comprehensive orthodontic treatment with fixed appliances.

Outcome measures: History or occurrence and extent of trauma to maxillary incisors. Expected cost of treatment.

Results: Forty-seven patients had trauma and there were no statistically significant differences in prevalence or severity of trauma between the groups or sexes at baseline. *Phase 1*—Sixteen patients sustained new trauma to 17 teeth. This increase was significantly different from baseline in the control and headgear groups but not the functional appliance group. *Phase 2*—Twenty-one patients sustained new trauma. This increase was significantly different from baseline in the control group, but not the functional appliance and headgear groups. There were no statistically significant differences in incidence of trauma between the groups or sexes in either phase. Most trauma was mild. The expected cost of treating the trauma was higher in the observation group.

Conclusions: A significant number of patients had trauma to their maxillary incisors. Most injuries were minor and could be treated cheaply. Early growth modification may influence the incidence of incisor trauma, but it may need to be instigated soon after their eruption for it to be effective.

Implications: This study suggests that early growth modification may reduce the incidence of incisor trauma. The additional cost of the trauma in the untreated group has to be balanced against the extra costs involved in 2-phase treatment.

***American Journal of Orthodontics and Dentofacial Orthopedics* 2003; 123: 321–328**

Comparison of skeletal and dental changes between 2-point and 4-point rapid palatal expanders
Lamparski DG, Rinchuse DJ, Close JM, Sciote JJ

Objectives: To determine whether there was a difference between midpalatal suture separation and dental arch width and perimeter expansion produced by between 2-point and 4-point rapid palatal expanders.

Design: A randomized controlled trial.

Setting: Pittsburgh, Pennsylvania, USA.

Participants: Thirty white patients, mean age 11.06 years (range 6.58–14.58 years).

Interventions: 4-point—Hyrax expansion screw with bands cemented to 6|6 and D|D or 4|4. *2-point*—Hyrax expansion screw with bands cemented to 6|6.The screws were activated twice a day (2 × 0.25 mm) until the tips of 6.|.6 were in contact with the buccal cusp tips of the mandibular first permanent molars.

Outcome measures: Intercanine and intermolar width, maxillary arch perimeter and suture separation measured from study models and occlusal radiographs.

Results: There were no statistically significant differences between the groups in the mean appliance separation, molar or canine expansion, or tip and width of median diastema. Post-treatment the changes in arch perimeter and mid-palatal suture separation were not significantly different, but there was more relapse during the retention period in the 2-point group. This resulted in the 4-point expander producing significantly greater increases ($P < 0.004$) in arch perimeter and mid-palatal suture separation post-retention.

Conclusions: The 2-point expander produced similar amounts of expansion during treatment, but it was not as stable during retention as that gained by the 4-point expander. Following retention, the 4-point expander had achieved significantly more skeletal separation and increase in arch perimeter than the 2-point expander.

Implications: This study suggests that if skeletal expansion and arch perimeter increase is required then it may be preferable to use a 4-point expander, rather than a 2-point expander.

***American Journal of Orthodontics and Dentofacial Orthopedics* 2003; 123: 379–387**

Clinical outcomes of Frankel appliance therapy assessed with counterpart analysis
Cevidanes LHS, Franco AA, Scanavini MA, Vigorito JW, Enlow DH, Proffit WR

Objectives: To determine whether the Frankel appliance produced changes in maxillary or mandibular position by affecting mandibular ramus alignment, and vertical dimension relative to the middle cranial fossae and posterior part of the nasomaxilla.

Design: A randomized controlled trial.

Setting: Sao Paulo, Brazil.

Participants: Eighty-four white Brazilian children at the end of the mixed dentition and beginning of the pubertal growth spurt with no early loss of deciduous teeth and no missing permanent teeth.

Interventions: Treatment—Frankel appliance worn full-time for 18 months. *Control*—Eighteen months observation followed by treatment.

Outcome measures: Counterpart analysis of lateral cephalograms to evaluate the vertical components that influence mandibular growth and response to treatment.

Results: Three-quarters of treated patients showed mandibular protrusive changes and 14% retrusive changes compared with 36% and 46%, respectively, in the untreated controls. There were statistically significant differences between the groups in the alterations in ramus alignment ($P = 0.003$) and ramus/middle cranial fossa relative to posterior maxilla vertical dimension ($P = 0.001$).

Conclusions: Treatment with the Frankel appliance produced alterations in maxillary and mandibular position that affected the ramus alignment and ramus vertical dimensions relative to the middle cranial fossa and posterior nasomaxillary dimensions. These changes resulted in more patients experiencing protrusive effects on the mandible.

Implications: Localization of favourable growth rotations, that are encouraged by functional appliances, may help in the differential diagnosis and identification of patients who will benefit most from treatment with functional appliances.

***American Journal of Orthodontics and Dentofacial Orthopedics* 2003; 123: 388–394**

Effect of Herbst treatment on temporomandibular joint morphology: a systematic literature review
Popowich K, Nebbe B, Major PW

Objectives: To evaluate the effect of Herbst treatment on TMJ morphology.

Design: A systematic review.

Data sources: All articles, assessing the effects of Herbst treatment on Class II patients that used magnetic resonance imaging (MRI), computerized tomography (CT), or axially or horizontally corrected tomography to image the TMJ, identified from searches of Medline, Best Evidence, Cochrane Database of Systematic Reviews and Embase from their inception until mid-2001.

Study selection: Controlled studies, using a minimum of an internal control, with pre- and post-treatment imaging of the TMJ. Case reports were excluded. Two authors read all reports to determine eligibility.

Data extraction: Data extracted included the experimental design, number of participants, effects on the glenoid fossa, condyle and temporomandibular disc position.

Data synthesis: A meta-analysis was not performed. Results were presented in descriptive and tabular forms.

Results: Eighty studies were identified by the searches. Twelve were related to the review topic and five were included. All included studies used internal controls. Four studies used overlapping patient samples that were not considered independent evidence. The effects of Herbst treatment on glenoid fossa and condylar remodelling, condylar and temporomandibular disc position was variable and inconclusive.

Conclusion: From the studies examined the nature and extent of glenoid fossa and condylar remodelling, and temporomandibular disc position could not be established. Changes found in the condylar position were minor and not clinically significant.

Implications: From the studies examined, it appears that Herbst treatment may only produce small changes in TMJ morphology that are probably not clinically significant. There is a need for RCTs, using serial MRI, to assess the true effect of Herbst appliance therapy on TMJ morphology.

***American Journal of Orthodontics and Dentofacial Orthopedics* 2003; 123: 489–496**

Comparison of peer assessment ratings (PAR) from 1-phase and 2-phase treatment protocols for Class II malocclusions

King GJ, McGorray SP, Wheeler TT, Dolce C, Taylor M

Objectives: To compare the dentoalveolar outcomes after 1- and 2-phase treatment protocols for Class II malocclusions.

Design: A randomized controlled trial.

Setting: Gainesville, Florida, USA.

Participants: Two hundred and seventy-six patients with Class II malocclusion.

Interventions: 1-phase—Comprehensive orthodontic treatment in adolescence. *2-phase*—Early treatment either with a bionator or headgear and biteplane, followed by comprehensive orthodontic treatment as required.

Outcome measures: PAR score and percentage change in PAR score.

Results: Two hundred and eight patients completed the trial. Dropout rate was 24.6%. There were no significant differences in the initial (P = 0.42), final (P = 0.42) or percentage reduction (P = 0.50) in PAR score between the three groups. The mean percentage reduction in PAR score for all groups was 69.8%. However, the 2-phase groups had a significantly lower PAR score (P = 0.001) at the start of phase-2 of treatment.

Conclusions: This study does not support the hypothesis that 1- and 2-phase treatment of Class II malocclusion achieves different dentoalveolar outcomes. However, this study does not address other reasons for undertaking 2-phase treatment.

Implications: This study suggests that, with respect to dentoalveolar change, 2-phase treatment was of no benefit. Further studies are required to assess other reasons, e.g. psychological benefit, trauma incidence, treatment time for adopting one or other of these protocols.