Face mask protraction therapy in early skeletal class III malocclusion

Does rapid palatal expansion enhance the efficiency of maxillary protraction with a face mask in developing class III malocclusions?

Vaughn GA, Vaughn B, Moon HB, Turley PK. *The effects of maxillary protraction therapy with or without rapid palatal expansion: a prospective, randomized clinical trial. Am J Orthod Dentofacial Orthop* 2005; 128:299–309.

Design The paper describes a continuing 5-year prospective randomised controlled trial (RCT).

Intervention The trial investigated the use of a customised face mask with a banded/ soldered jackscrew palatal expansion appliance in the two treatment groups under study, compared with control; in one treatment group, the appliance was activated twice daily (0.5 mm/day) for a minimum period of 7 days (the expansion group) and in the other was maintained passively (the nonexpansion comparative treatment group). Both groups received 300–500 g elastic force to the face mask on a fulltime basis. Patients in the control group were observed for at least 12 months then randomly assigned to one of the two treatment groups.

Outcome measure The outcome measure was the clinical evaluation of an overcorrected class I molar relationship approaching an end-to-end relation with a positive overjet of 4–5 mm. Cephalometric assessment was made with traditional measurements to describe the changes occurring between pretreatment, post-treatment and control lateral cephalograms; the changes in 55 landmarks were evaluated relative to an x–y coordinate system. The treatment effects were quantified using the Johnston analysis.¹

Results Forty-six children of age 5–10 years were recruited into the study and were randomly assigned to group A (expansion; $n=15$), group B (nonexpansion; $n=14$) or group C (control; $n=17$). There was no statistically significant difference between the clinical outcomes nor cephalometric variables in treatment groups A and B. The total class III correction achieved was 4 mm, according to the Johnston analysis, 3.69 mm in group A (expansion), and 4.35 mm in group B (nonexpansion). Only one-third of the skeletal change was attributable to maxillary protraction with two-thirds of the change being attributed to mandibular rotation. The combined movement of the maxilla and the mandible produced an ANB angle of $+3.87^\circ$ and $+3.99^\circ$, and a Wits change of $+3.89$ and $+3.74$ mm.

Conclusions Face mask protraction therapy provides effective correction in early class III malocclusion. The need for palatal expansion in the absence of a transverse discrepancy or a skeletal/ dental crossbite is not supported by the results of the study. Correction results from a combination of skeletal and dental change with an overall improvement in the dentofacial complex.

Commentary

Maxillary protraction is an emerging paradigm in the early management of skeletal class III malocclusion. A growing realisation that a hypoplastic maxilla may be a primary aetiological factor in class III malocclusions, coupled with the limited ability to influence mandibular growth, has enforced this new concept. The efficiency of maxillary protraction is well-established and supported by the existing literature.

This study is possibly the first prospective RCT of the subject. One of its striking features is the inclusion of a control group to quantify growth before recruiting participants to the two treatment groups. This addresses the major issue of why a true controlled experiment, an RCT, is difficult in the clinical orthodontic environment, where the controls need to be denied treatment. Clinical orthodontics needs to address the effect of a treatment modality on a growing dentoskeletal base and to filter the effects of treatment from those induced by growth. The inclusion of the control group opens an evidence-based window for clinical trials in orthodontics.

Science is based on hypotheses and, indeed, advocating that maxillary expansion be used even in the absence of a crossbite or transverse discrepancy is similarly based on conjecture. The theory seems to be that disarticulating the circum-maxillary sutures will create a more pronounced orthopaedic effect. The evidence and the results of this clinical trial suggest otherwise. Both the expansion and the nonexpansion groups demonstrate significant skeletal change ($P<0.001$) relative to the control group: there is no significant difference in the skeletal correction achieved in expansion and nonexpansion group. A meta-analysis by Kim *et al.* in 1999² also showed no significant differences between palatal expansion and nonexpansion groups.

The results of the clinical trial are conclusive: the skeletal change following protraction is significant, but has no correlation with expansion. The maxillary protraction accounts for a third of a total skeletal correction with mandibular posterior rotation accounting for two-thirds of the change.

The problems of quantifying the dentoskeletal changes on 55 landmarks relative to any x–y co-ordinate system are addressed by using the Johnston analysis,¹ which reflects the total class III correction, and the algebraic sum of various skeletal and dental changes which quantifies the changes to about 4 mm.

A comparative evaluation with published studies provides a rich didactic continuum. Most previous studies have either had no control or at best a non-randomised short-term observation period before the clinical trial. The present study addressed this issue by using a control group to differentiate treatment effects from normal class III growth in a controlled environment. It successfully analysed maxillary protraction by using several measurement systems. The only obvious problem in using the Johnston Occlusal Plane Analysis is that it tends to measure a smaller anteroposterior change in the maxillary position — but then, quantifying treatment change in clinical orthodontics is always difficult and this trial has managed to integrate and quantify the net change that can be attributed to protraction face mask therapy. If you can

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measure it, it's science: if you cannot, it's art! It has been a longstanding issue in clinical orthodontics that art has been favoured over science. It is studies like this that will open the doors of evidence-based orthodontics.

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1. Johnston LE. A comparative analysis of class II treatments. Monograph 19. Craniofacial Growth Series. Ann Arbor: Center for Human Growth and Development, University of Michigan; 1986; pp 103–148.
2. Kim JH, Viana MA, Graber TM, Omerza FF, BeGole EA. The effectiveness of protraction face mask therapy: a meta-analysis. *Am J Orthod Dentofacial Orthop* 1999; 115:675–685.

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