European Journal of Orthodontics 34 (2012) 788–791

Letters to the Editor

European Journal of Orthodontics 34 (2012) 788
doi:10.1093/ejo/cjs030
Advance Access publication 9 May 2012

Conundrum in vertical dimension changes

Dear Sir,

I have read with interest the article by Chhibber *et al.*, (2011) comparing the changes produced by the Begg appliance and the preadjusted edgewise appliance (PEA) on vertical dimension. The theory of the occlusal wedge hypothesis has been researched extensively in recent times for its appropriateness in the clinical treatment scenario and no firm evidence has been substantiated (Sivakumar and Valiathan, 2008; Gkantidis *et al.*, 2011). I have few concerns that I would like to raise.

The present study results could have been more valid if a control sample (non-extraction group) has been used in each group (Begg and PEA). This would have allowed the treatment changes from the extraction protocol to be assessed.

The authors reported that in cases (PEA) where the bite deepened, an intrusion arch was used. There was no explanation in the article as why there was closure of the bite (Figure 2(d) in the article). It is a little unusual to retract the canines in round wire in a straight wire mechanics (except the Alexander Discipline mechanics). Could this have been a possible reason or really the occlusal wedge hypothesis in action?

The authors discussed that the Begg technique was marginally better at conserving anchorage than the PEA. As part of the study protocol, the authors never considered any form of anchorage support in the PEA cases although the conventional Begg technique had inherent differential anchorage support. Hence, it is prudent to argue that there will be more anchorage slippage in the authors' PEA sample. I feel that our treatment mechanics and protocols should dictate the treatment outcome and not the technique as such.

Even though the sample included subjects in cervical vertebral maturation (CVM) stage VI of skeletal maturity, the contribution of 'residual growth' to the treatment effects needs clarification. The increase in face height and the mesial movement of molars could be consequent to mechanotherapy or residual growth (Gardner *et al.*, 1998; West and McNamara, 1999).

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European Journal of Orthodontics 34 (2012) 788–789
doi:10.1093/ejo/cjs047
Advance Access publication 5 October 2012

Reply

Dear Sir,

We would like to thank Dr Sivakumar for his interest in this article and for the comments.

We agree with Dr Sivakumar that there should have been a control sample to analyse the effect of extractions in both Begg and pre-adjusted edgewise appliance (PEA) so that the hypothesis of the 'wedge effect' could be verified to a greater accuracy. However, as Dr Sivakumar points out himself that the wedge hypothesis has been studied extensively, the objective of this study was to analyse this concept further by trying to understand if there would be a difference between the Begg and PEA treatment techniques in

terms of their effect on the facial vertical dimension. The Begg technique relies heavily on the use of anchor bends in archwires with inherent use of Class II elastics for correction of the presenting malocclusion. Such mechanics can cause significant extrusion of the molars, resulting in the possible alteration of the facial vertical dimension.

Canine retraction is frequently performed (Shpack *et al.*, 2007; Burrow, 2010) on a 0.018 inch steel archwire and it does not seem unusual to us to do the same. However, during canine retraction an iatrogenic deep bite is created due to deflection of the wire under the influence of a retraction force (Gjessing, 1994; Upadhyay and Nanda, 2010). This may have been the cause for bite deepening and therefore the intrusion arches were used wherever it was deemed necessary.

Dr Sivakumar brings out an interesting point that the Begg technique has an inherent differential anchor support as it pits bodily movement of the anchor unit against tipping and uprighting movements of the anterior teeth. However, despite this, we observed no difference between the two groups indicating that probably the uprighting phase had a significant strain on the anchor unit during torqueing, resulting in posterior anchor loss. However, this is just a theoretical assumption which makes perfect mechanical sense. In order to generate evidence for such an effect, lateral cephalograms taken before and after the uprighting phase of the incisors will have to be analysed.

'Residual growth' is often used to describe any changes occurring in the skeletofacial characteristics of the face after majority of the intended growth is completed. These changes might occur even after the removal of orthodontic appliances. Growth of the face in the vertical dimension is generally considered to finish the last amongst the three spatial planes. Therefore, we mentioned that it might be interesting and worthy to observe the long-term changes that occur with these two different techniques.

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European Journal of Orthodontics 34 (2012) 789–790
doi:10.1093/ejo/cjs039
Advance Access publication 5 September 2012

Cautious use of thread shape factor

Sir,

Recently, Migliorati *et al.* (2012) evaluated the correlation between thread depth, thread pitch and thread shape factor (TSF), and maximum insertion torque (MIT) and found the strongest correlation between TSF and MIT (r = 0.902, P = 0.001) with a 2.2-mm cortical thickness of experimental bone. The article is interesting and among few studies in Orthodontics evaluating the prediction power of TSF for clinical decisions. I have some comments on the way they applied the Chapman equation.

Originally, Chapman *et al.* (1996) introduced an equation to correlate various characteristics to predict pull out strength of cancellous screw for orthopaedics application. The equation was as follows:

$$\text{pull out} = \text{shear} \times \pi \text{LD}_0 \times \left(\frac{1}{2} + \frac{1}{\sqrt{3}} \quad / \quad \right)$$

where F, S_{shear}, L, D_0, d, and p was pull out strength (N), shear strength of the bone (MPa), length of engaged intraosseous part (mm), external diameter of miniscrew (mm), thread depth (mm), and thread pitch, respectively. They introduced $\left(\frac{1}{2} + \frac{1}{\sqrt{3}} d / p \right)$ as the thread shape factor. It is noteworthy that this formula was designated for cylindrical screws, in which cross-sectional area of osseointegrated part is equal through the length of engaged part. More recently, Tsai *et al.* (2009) modified the original formula to be applicable in conical and tapered forms that are used with growing interest in routine practice of various disciplines of medicine and dentistry.

The modified Chapman formula is

$$dF_{\text{pull out}} = S^*_{\text{shear}} \times \left[\pi D_0 (x) dx \right] \times \left[\frac{1}{2} + \frac{1}{\sqrt{3}} \frac{D_o(x) - D_i(x)}{2p} \right]$$