

**SCIENTIFIC  
SECTION**

## Commentaries on scientific papers published in this edition

### Asymmetric headgear for differential molar movement: a study using finite element analysis

**L. R. Squeff, A. C. Oliveira Ruellas, N. D. Penedo, C. N. Elias, E. F. Sant'anna, G. R. Casaccia, J. C. Gomes, J. P. Gouvêa**

Asymmetric headgear is recommended when the required molar movement on the right side of the dental arch does not equal to that of the left side. In these cases, asymmetric force system should be applied to achieve differential teeth movements between the right and left sides. As the cervical headgear is activated by a strap which applies similar forces on the right and left maxillary molars, efforts were done to modify the symmetric headgear in order to create different force levels on both first molars which eventually result with different tooth movements between the right and left sides. Clinical, theoretical and experimental studies were previously presented related to this issue. However, for the first time, the finite element method is applied in this study to show that different configurations of asymmetric headgear provide different forces on the right and left molars. Using the same patient model and considering mechanical properties of the living tissues (teeth, bone and periodontal ligament) as presented in previous studies, the influence of four asymmetric headgear configurations on the initial forces and movements of those teeth are presented.

As with any simulation, models are based on several assumptions. For example, the linear and isotropic mechanical behaviour of the living tissues and limitation in accurate definitions of the boundary conditions are common approximations in finite elements models. However, this study provides numerical results of four different asymmetric headgear configurations which were previously presented in the literature and therefore the results could be compared.

The results of this study show that the highest difference in distal force between both sides is achieved by adding an activated transpalatal arch between the

molars. Also the asymmetric outer bow lengths headgear was effective in transferring differential distal forces to the molars. The other two asymmetric headgear systems, (i) higher outward angulation of the desired distal force side and (ii) soldering the outer bow arm to the inner bow arm on the desired distal force did not provide the required tooth movement and even in the case of linking and soldering the outer and inner bows created opposite direction tooth movement.

The authors of this study show the capability of the finite element method to inform on 3-dimensional initial tooth movement tendencies, and this method should be considered as any other scientific experimental methodology in simulating headgear treatments.

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### Aesthetic Impact of Malocclusion in the Daily Living of Brazilian Adolescents

**Leandro S Marques, Cid A Filogônio, Cíntia B Filogônio, Luciano J Pereira, Isabela A Pordeus, Saul M Paiva, Maria Letícia Ramos-Jorge**

Many orthodontists wonder why some teenagers with a substantial malocclusion seem to be happy with their appearance, whilst others with a relatively mild malocclusion seek treatment or consider their mouth unattractive. How does malocclusion affect the teenagers' quality of life? What factors, both subjective and objective, influence oral health related quality of life? This study conducted in Brazil aimed to answer these questions.

This is a large, well-designed, population study conducted in the city of Belo Horizonte, which is the fifth largest city in Brazil. It achieved a very high participation rate (90%) and included 448 teenagers

aged 14-18 with no prior history of orthodontic treatment. The main outcome measure was presence or absence of aesthetic impact (AI), determined by a measure called the Oral Impact on Daily performances (OHIP). Potential factors included clinical details from an examination carried out by an orthodontist, child self perception and parental perception of their child's dental aesthetics.

Almost a quarter (24%) of the teenagers reported that they felt embarrassed to smile. The univariate analysis demonstrated that certain clinical characteristics of the malocclusion, such as at least one missing tooth, upper anterior crowding, presence of a median diastema or an anterior maxillary overjet and normative treatment need were statistically significantly associated with AI. Both parental and self-reported treatment need and parental and self-perceived aesthetics were strongly associated with AI. Interestingly, amongst the socio-demographic factors, neither age, gender or self-esteem had a relationship with AI, but socio-economic level and both father's and mother's schooling were related to AI.

One limitation with the analysis is that the above factors may correlate with each other and therefore the authors created a most parsimonious multivariate logistic regression model, which was able to discriminate between the presence and absence of AI. The model consisted of clinical parameters such as upper anterior crowding, median diastema and normative treatment need and only one participant characteristics: socio-economic level.

This study confirms that the appearance of the teeth does have a big impact on a teenager's quality of life. Unfortunately, the authors did not make any suggestions about how the results of this study might be used in the planning of orthodontic services.

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## Nasal morphology as an indicator of vertical maxillary skeletal pattern

**K. Nehra, V. Sharma**

The article is an excellent step forward in the orthodontic literature by emphasizing the need to evaluate the patient's face holistically rather than classifying them as mere class I, II or III malocclusion. The results tell us how we can obtain clues as to underlying skeletal deviations from a proper clinical and radio-

graphic examination. The authors have formulated their hypothesis based on clinical observations. Clinicians might have a diagnostic dilemma if a patient presents with bimaxillary protrusion when examined from the front, but when looking at their profile there is an obtuse nasolabial angle. The dilemma is whether to extract premolars in these patients and potentially dish-in the middle third of the face with over-retracted incisors. The results of this study provide some valid and informative evidence into this phenomenon of an anti-clockwise rotation or deficient descent of the anterior maxilla. For this purpose the authors have utilized the most common diagnostic aid used by orthodontists – the cephalogram.

The important association between vertical maxillary skeletal pattern and nasal growth has also been investigated using the same methodology. The results depict how proportionate the facial structures are to each other and how growth is often complimentary. The correlation between nasal length and nasal depth revealed with measurement of anterior face height, especially upper anterior face height and the inclination of the palatal plane is a reminder to orthodontists of possible adverse changes to the facial features if the mechanics employed is not monitored properly at each patient visit. The diagnosis and treatment planning process, retraction mechanics and finishing procedures should be employed in a judicious manner so that over-retraction of incisors, creating an imbalance in the facial harmony and in particular greater prominence of the nose are to be avoided.

The study is performed on a sample size of 190 Indian adults providing us with an appropriate study design and reasonably valid results. The drawbacks of this study is its complete reliance upon cephalograms, which are only a two dimensional representation of three-dimensional facial structure. Moreover the researchers have looked into too many parameters for association making the study an epidemiological one. Another limitation is that the references could be considered slightly dated, with the most recent reference cited from 2004.

Despite the shortcomings, the researchers are able to come up with valid and diagnostically relevant conclusions and I agree with the authors in their statement that future works on different population groups might increase the validity and clinical relevance of results generated through this research.

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## **An evaluation of the effects of a web-based modular teaching programme, housed within a virtual learning environment on orthodontic training for specialist registrars**

**B. Mulgrew, K. Drage, P. Gardiner, T. Ireland, J. R. Sandy**

This paper is a comprehensive analysis of the effects of the adoption of a web-based virtual learning environment (VLE) on an orthodontic training programme. The initial aspiration of the adoption of the VLE had been to reduce travel time for trainees and to reduce the demands on academic staff. The methodology using triangulation of the data from the software itself, student diaries, semi-structured interviews and focus groups provides qualitative data that aims to improve our understanding of this group's individual circumstances but does not, unlike quantitative research, aim to produce a universal truth applicable to all. However, there is much to gain from this understanding and we cannot help but empathize with a group of trainees who are prepared to travel for face to face contact with their teachers and the academic staff who despite their considerable efforts to provide content knowledge on-line still have the enthusiasm to provide their academic teaching.

The VLE is very well described, the structure and functionality of this software has been used, in other areas, to drive teaching and learning in a particular direction usually to encourage interaction and 'active' learning. However, the poor uptake of the discussion boards in the VLE must be judged in the light of the blended nature of the learning on the course, confusion over their utility and the absence of their uptake in assessment. Students clearly felt reassured all the 'content knowledge' was available on-line however, the application and understanding of this knowledge was measure off-line. Perhaps in a clinical speciality like orthodontics this is not unreasonable as we need orthodontists who can talk rather than orthodontists who can type. For this type of discussion board to be useful a 'climate of trust' must exist and an effort made to continue the dialogue.

Some of the attractions of a virtual learning environment are obvious; the fact content knowledge can be easily updated and the flexibility to access material at a time that suits the trainee. However, the security of access to certain knowledge and the capacity of the software to monitor both teachers and learners activity may have more long term significance to orthodontics. Revalidation and

continuing professional development may well make use of VLEs and in the light of that this paper is of universal interest. I would strongly recommend it to our readers.

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## **Colour changes of orthodontic elastomeric module material exposed to *in vitro* dietary media**

**A. P. Ardesbna, T. K. Vaidyanathan**

Dentistry is an integral part of the 'Technology Era' with lasers, CAD/CAM and 3D – imaging changing the face of dentistry daily. Orthodontics has not been immune to technological advances and faster, more efficient, less invasive and aesthetic alternatives are continually sought

'Aesthetic and Invisible orthodontics' is part of the technological era and beautiful straight teeth are no longer only the dream of many patients worldwide, but a reality for many. In fact, over the past two decades, there has been a surge in the number of patients of all ages requesting, even demanding 'invisible orthodontics'. The advent of clear brackets, Teflon-coated and polymer-composite arch wires, clear tooth aligners and Lingual braces have been the profession's response. Adults in particular are a growing demographic of those patients interested in receiving orthodontic treatment which is more aesthetic.

Elastomeric ligatures were introduced and popularized in the 1970s to replace stainless ligatures in order to increase clinical speed and efficiency in orthodontics while elastomeric chains were a space closure innovation in sliding mechanics. One of the important desirable characteristics of elastomerics, is stain resistance, although clinically, elastomerics continue to be fraught with undesirable properties such as hydrolytic decomposition, staining, force decay and shape deformation. Fluoride was later added to elastomeric ligatures as an anticariogenic, but Wiltshire<sup>1</sup> found that although elastomerics were a suitable vehicle for fluoride release around orthodontic brackets, they imbibed oral fluids, swelled and discoloured, making their overall clinical benefit questionable and they were subsequently withdrawn from the orthodontic market.

'Aesthetics' and 'fashion' are not mutually exclusive and clinically it is not uncommon to have a patient ask for clear braces and at the same time request a rainbow of vibrantly-coloured elastomeric ligatures to hold the

arch wires in place. In fact, many patients reject self-ligating brackets, despite their perceived frictionless advantages, because the choice of monthly coloured elastics changes, are a fun and important fashion accessory decision, whether they are being treated with clear brackets or not. However, discolouration of the elastomerics is simply not tolerated by aesthetic and fashion conscious patients!

The research results by Dr Anil Ardeshta and Dr Tritala Vaidyanathan in the present article is important for orthodontists to consider when placing elastomeric ligatures, particularly in adults. Stainants like coffee, curry spice mixes and red wine have a strong tendency to cause discolouration<sup>2</sup> and should be avoided in esthetically conscious patients. Alternatively, darker coloured elastomerics are advised. Smokers may also expect discolouration to occur, but requires further research.

Because self-ligating brackets are increasing in popularity, it could be anticipated that the use of

elastomeric ligatures may decrease. However, it is not expected that conventional bracket use, nor elastomeric use, will disappear any time soon. Accordingly, it remains prudent for the orthodontist to change elastomerics regularly and use more stain-resistant products in patients where diet and habits may affect staining.

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