

FEATURES SECTION

Relevant research from non-orthodontic journals

This occasional section is designed to draw the attention of readers to papers that have been published in non-orthodontic journals, but which may be of interest. The abstracts have been selected and edited by Mark Sayers and Nigel Hunt.

Aesthetics

Teeth and gingival display in the premolar area during smiling in relation to gender and age. *J Oral Rehabil* 2005; 32: 830–7

Kapagiannidis D, Kontonasaki E, Bikos P, Koidis P

Objective: To determine the amount of maxillary premolar and associated gingival display during smiling in relation to gender and age.

Methodology: The sample consisted of 90 males and 113 females, with an age range 16–84 years. Subjects were included if their dentition was caries free, with no restorations or tooth mobility, and no previous orthodontic or surgical treatment. The maxillary teeth and gingival display were assessed by 2 photographs of the lower face: the first was taken in maximum smile, whilst the second photograph was a retracted frontal view. Measurements were carried out on the photographs by 2 independent dentists. Thirty randomly selected subjects were re-measured at different times to assess inter-examiner variability. The clinical crown length, tooth and gingival display were measured for the upper left premolars, whilst the central incisors and canines were used as the control.

Results: Premolars were partially visible in more than 80% of smiles, displaying more than 65% of their clinical crown length. The least display was recorded for the first premolars compared to the second premolar ($p < 0.001$). Tooth display was greater in females, but statistically significant only for the central incisors ($p < 0.05$). No significant differences were found between the age subgroups. Gingival display was greater in premolars compared with both central incisors ($p < 0.001$) and canines ($p < 0.05$). Displayed gingivae in the first and second premolars were 44 and 49%, respectively. In addition, more gingival display was found in females and younger subjects.

Conclusion: The mean maxillary gingival display was greater in the premolar region compared to the central

incisor and canine region, regardless of gender. Tooth display was greater in females in all groups of teeth examined, but only statistically significant for the central incisor region.

Comment: Additional work is required in regards to measurement of the molars, commissure lifting and other soft tissues associated with the smiling process. However, this paper reveals further insight into tooth and gingival display of the maxillary premolars during smiling, which is important for optimum aesthetic results in orthodontics.

Imaging software

Dolphin imaging software: An analysis of the accuracy of cephalometric digitization and orthognathic prediction. *Int J Oral Maxillofac Surg* 2005; 34: 619–26

Power G, Breckon M, Sherriff M, McDonald F

Objective: To examine and compare the reproducibility and reliability of digitization using Dolphin Imaging Software (version 8.0) with traditional manual techniques. In addition, orthognathic prediction was compared with actual outcomes.

Methodology: In stage 1—60 lateral cephalograms were evaluated using manual tracing and indirect digitization using Dolphin Imaging Software (version 8.0). Method error (reliability) using duplicate measurements for each method and comparison of both techniques (reproducibility) were investigated statistically.

In stage 2—comparison of the predicted and actual software outcomes was made. Participants were included if they had undergone pre-surgical orthodontics and orthognathic surgery. A lateral cephalogram was taken pre-surgery and within 3 months post-surgery. All post-surgery radiographs were retraced to check operator reliability and reproducibility.

Results: Each technique was significantly reliable at 95% level (method error). The manual tracing was more reliable for SNA (1.36° manually and 2.07° digitally), SNB (1.19° manually and 1.69° digitally), SNMx (1.39° manually and 2.66° digitally) and MxMd (1.77° manually and 2.26° digitally). Dolphin digital tracing was more reliable for UIMx (3.49° digitally and 3.97° manually), LIMd (2.90° digitally and 3.04° manually). In addition, systematic error in the software's calculation of LAFH% resulted in measurements 4% larger than the manual technique, which is clinically significant. The comparison of predicted outcome and actual outcome showed clinically significant differences for all measurements. There was a low concordance for ANB (0.32).

Conclusion: Dolphin Imaging Software (version 8) lacks information required to compensate for radiographic magnification. Although this does not affect angular measurements for diagnostic purposes, this does have a significant effect when considering orthognathic movements. The software needs to be re-assessed to reduce software error, which may result in significant clinical miscalculations. Radiographic magnification affects both the vertical (reflected by LAFH%, SNMx and MxMd) and horizontal (reflected by SNA, SNB and ANB) planes. The current program is not yet as reliable as traditional techniques for orthognathic planning.

Comment: Advances in computer technology have made access to cephalometric prediction software available for diagnosis and treatment planning. This paper reveals the reliability of one software package and adds useful information to a gap in the literature.

Anterior open bite

Occlusal force and condylar motion in patients with anterior open bite. *J Dent Res* 2005; 84: 133–7

Miyawaki S, Araki Y, Tanimoto Y, Katayama A, Fujii A, Imai M, Takano-Yamaoto T

Objective: Patients with open bite often show a weak occlusal force and temporomandibular disorders (TMDs). If these are the main cause of open bite, it may be hypothesized that both pre-pubertal and adult open bite patients would be expected to show a weak occlusal force and abnormal condylar motion. The purpose of this study was to test this hypothesis.

Methodology: The test group of patients consisted of 13 pre-pubertal children, aged 8–12 years (3 boys and 10 girls) and 13 adult female patients, aged 18–30 years with an anterior open bite evident since childhood. The control group was aged-matched and consisted of 14

pre-pubertal children (4 boys and 9 girls) and 14 adult females with normal incisor relationships. Jaw movement was recorded and analysed with an opto-electric jaw tracking system. An occlusal force recording system was used to record maximum occlusal force and contact area.

Results: The adult open bite group showed a weaker occlusal force and a shorter range of condylar motion compared with the control group. In the pre-pubertal subjects there were no significant differences in the occlusal force and range of condylar motion between the open bite and control subjects.

Conclusion: The results suggest that a weak occlusal force or TMD may not be the main cause of open bite.

Comment: This is a controversial topic and this paper attempts to add more insight into the relationship between occlusal force, TMD and anterior open bite.

Functional appliances and skeletal III malocclusions

Geometric morphometric assessment of treatment effects of maxillary protraction combined with chin cup appliance on the maxillofacial complex. *J Oral Rehabil* 2005; 32: 720–8

Chang HP, Lin HC, Liu PH, Chang CH

Objective: To investigate the treatment effects on the maxillofacial complex by maxillary protraction combined with chin cup therapy among growing children.

Methodology: Twenty children (mean age 9 years and 11 months) underwent combined maxillary protraction and chin cap therapy for a mean period of 16 months, for treatment of Class III malocclusion caused by maxillary retrusion, mandibular protrusion or a combination of the two. The control group consisted of age and sex matched individuals (mean age 9 years 10 months) with Class III malocclusions and observed for a period of 17 months. A diagnosis of Class III malocclusion was based on molar relationship and an anterior crossbite. For the treated group, elastic traction of 200–250 g force/side was applied to the maxillary molars with a downward and forward direction to hooks on the chin cap. A bilateral retraction force of 200–250 g/side was applied on the mandible by the chin cap for a period of 12 hours/day. Lateral cephalometric radiographs were taken and digitized, pre- and post-treatment, and at the corresponding time points for the controls. Procrustes analysis and thin-plate spline analysis (TPS) were applied to evaluate shape change in the craniofacial and midfacial

configurations of the 2 groups. An error study was undertaken based on 30 repeat radiographs.

Results: In the treatment group there was forward advancement of the maxilla with negligible rotation of the palatal plane. In the mandible there was forward growth of the mandibular condyle and restricted growth of the chin. In addition, there were marked proclination of the upper incisors and reduction of the reverse overjet, suggesting a dentoalveolar contribution.

Conclusion: TPS analysis shows the degree of transformation within the craniofacial and midfacial geometric configurations due to treatment or growth. This study showed that maxillary protraction in combination with a chin cap appliance affects all the skeletal components contributing to a Class III malocclusion including the mandible and cranial base.

Comment: There are various techniques used to evaluate the treatment effects of an orthopedic force on the craniofacial structures. Evaluating morphological data is important in understanding remodeling of the craniofacial bones. This study uses Procrustes and TPS analysis to assess the morphological changes on the maxillofacial complex using maxillary protraction with chin cap therapy. However, separate TPS analysis of the cranial base and mandibular complex is required to analyse the remodeling effect of maxillary protraction and chin cap therapy in true skeletal Class III cases.

Pediatric Dentistry

Orthodontic management of orofacial problems in young people with impairments: review of the literature and case reports. *Int J Paediatr Dent* 2005; 15: 355–63

Hobson RS, Nunn JH, Cozma I

Objective: To present a series of cases illustrating possible options for the management of malocclusions in a group of young people with impairments.

Study design: Case series.

Methodology: A review of the published literature was carried out, followed by illustrative case reports.

Results: Five children with varying intellectual and/or physical impairments, in addition to malocclusions resulting from trauma or disability were presented. The paper highlights the difficulty of assessing behavior objectively in anticipation of orthodontic treatment in patients with impairments.

Conclusion: Although orthodontic treatment is possible, the risk-benefit of treatment and the anticipated oral

health outcome needs to be considered carefully in this group of patients.

Comments: This paper is a timely review due to the previous changes in UK legislation regarding disability discrimination. It highlights the need for the orthodontist to work closely with the pediatric dentist, as both restorative and preventive dentistry is required in many cases. Further information is required with regards to an objective tool in deciding who should receive orthodontic treatment, and how it is provided for this group of patients.

Head posture

Preliminary report on head posture and muscle activity in subjects with Class I and II. *J Oral Rehabil* 2005; 32: 794–9
Gadotti IC, Berzin F, Biasotto-Gonzalez D

Objective: To analyse the head posture and the muscle activity of the anterior temporal and masseter muscles among subjects with bruxism and different malocclusions.

Methodology: Participants consisted of 20 females aged 17–27 years, who presented with bruxism for 6 months or more. They were divided into 2 groups based on either an Angle's Class I or II molar relationship. An assessment of forward head posture was conducted using a photographic technique (angular calculus) combined with a clinical analysis. Electromyography (EMG) using differential surface anodes (Ag) were positioned bilaterally on the belly of the masseter and temporal muscles, perpendicular to the muscle fibers. The EMG signal recorded during bilateral isotonic mastication was presented using the root mean square and processed by Matlab software.

Results: The head-neck angle analysis with the photographic technique showed a significant difference between Class I and II. Those with Class II occlusion had a larger head-neck angle. Eighty-three per cent of Class II occlusions had a forward head posture. There were no significant differences in EMG data of the temporal and masseter muscles. However, the masseter muscle tended to be more active in Class I individuals. In Class II occlusions the temporal muscle tended to be more active.

Conclusion: This study indicates a suggestion that the EMG responses of the temporal and masseter muscles may be modified in patients with Class II occlusions. Furthermore, subjects with Class II occlusion and bruxism, presented with hyperactivity of the temporal muscles and a greater occurrence of forward head posture.

Comment: There are few studies in the published literature associating dental occlusion, head posture and muscle activity. However, further work is required to include Class III occlusions, based upon larger sample sizes.