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FEATURES SECTION

Relevant research from non-orthodontic journals

This 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 Oliver Campbell and Professor Nigel Hunt.

Orthognathic surgery

Effects of mandibular setback surgery on oropharyngeal airway and arterial oxygen saturation. ***Int J Oral Maxillofac Surg*** **2008; 37: 328–33**
Kitagawara K, Kobayashi T, Goto H, Yokobayashi T, Kitamura N, Saito C

Objective: It has been suggested that some patients may be at risk of obstructive sleep apnoea (OSA) following mandibular setback surgery, due to a reduction in the pharyngeal airway and changes in the surrounding hard and soft tissues. This study was conducted to determine the short- and long-term effects on patient craniofacial and pharyngeal morphology and respiratory function during sleep after this surgical procedure.

Methodology: Seventeen patients (5 males and 12 females) presenting with Class III malocclusions ($\pm$open bites and asymmetry) were corrected using a bilateral sagittal split ramus osteotomy by one operator. All patients received the same treatment of pre- and post-operative orthodontics and resorbable skeletal fixation. Measurement of overnight arterial oxygen saturation (SpO_2) was by pulse oximetry at five time-points [before surgery (T0), three days (T1), seven days (T2), one month (T3) and six months (T4) post-surgery]. Morphological craniofacial changes were assessed by lateral cephalometric analysis using well-defined angular and linear measurements. Interviews assessing subjective symptoms of snoring and apnoea during sleep were conducted before surgery and six months post-surgery.

Results: A significant posterior movement of the mandible occurred at surgery at Pog [mean: 8.6 mm ($P<0.001$) horizontally and 2.4 mm ($P<0.01$) vertically]. No significant horizontal changes were observed at Pog in periods T1–T3 and T3–T4. There was a significant increase in the nasopharyngeal depth ($P<0.01$) but no significant change in the posterior airway space. Significant inferior displacement (mean: 10.6 mm) of the hyoid bone was seen at surgery ($P<0.001$) with significant upward movement at T1–T3 ($P<0.01$). A decreased SpO_2 was found just after surgery (T1), but had improved one month after surgery (T3), this was not significant. There were no significant differences between subjective symptoms of snoring and apnoea during sleep before and after surgery.

Conclusion: In the short term, this study showed that on average, respiratory function worsened significantly following mandibular setback surgery but had improved significantly by one month. This varied, however, depending on a number of factors such as the patients' BMI and amount of mandibular setback. Longer-term (six months post-operatively), almost all of the subjects had adapted to the new environment in respiratory function during sleep and there was no evidence of sleep-disordered breathing.

Comment: This paper does provide useful insight into an often unappreciated post-operative complication of mandibular setback surgery which, as part of bimaxillary surgery, is commonly used to correct Class III skeletal deformities. Clinicians should be aware that a decreased SpO_2 may occur immediately post-operatively. Therefore, certain groups of patients undergoing this procedure may be at risk of developing OSA and need to be made aware of this during the consent process.

Risk factors for a bad split during sagittal split osteotomy. ***Br J Oral Maxillofac Surg*** **2008; 46: 177–79**
Kriwalsky MS, Maurer P, Veras RB, Eckert AW, Schubert J

Objective: Sagittal split osteotomy (SSO) is a commonly used technique in orthognathic surgery. The purpose of this study was to investigate if there was an association between the occurrence of 'bad splits' during SSO and the presence of third molars, the patient's age and the qualifications of the surgeon.

Methodology: The clinical notes and radiographs of 110 consecutively treated patients were analysed

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retrospectively and the parameters of age, sex, presence of the third molar, the incidence and site of bad splits and surgeon experience chosen for analysis. A total of 220 bilateral SSOs (96 in male and 124 in female patients) using the Obwegeser/Dal Pont technique were evaluated. The patients were divided into three groups; 1: SSO where the third molar was missing ($n=168$); 2: SSO with a retained or impacted third molar that was removed during the procedure ($n=23$) and 3: SSO with the third molar left *in situ* ($n=29$).

Results: There were a total of 12 (6%) bad splits of which all fractures were proximal to the osteotomy line. The mean age of all patients who had a bad split was 35 (range 21–60) compared with 25 (17–45) years in patients who did not. Patients experiencing bad splits were significantly older ($P=0.01$). There were nine (5%) bad splits in group 1, two (9%) in group 2, and one (3%) in group 3. There were no significant differences in the incidence of bad splits among the three groups ($P=0.8$). There was no significant difference of the surgeon's qualification on the incidence of bad splits ($P=0.4$).

Conclusion: Controversy still remains about whether the third molars increase the incidence of a bad split during SSOs. It appears that older patients seemed more at risk of a bad split than younger ones and should be considered the main complicating factor.

Comment: This paper is interesting as it sheds further light onto the debate as to whether prophylactic third molar removal prior to a SSO procedure is an absolute necessity.

Orthodontic anchorage

Cortical bone thickness in the buccal posterior region for orthodontic mini-implants. *Int J Oral Maxillofac Surg* 2008; 37: 334–40
Ono A, Motoyoshi M, Shimizu N

Objective: This study's primary aim was to investigate, using super-high-resolution dental computed tomography (CT), cortical bone thickness in the buccal posterior region mesial and distal to the first molar, a region where mini-implants are often placed. The secondary aims were to determine any differences according to location, age and sex.

Methodology: Forty-three patients (32 females and 11 males; mean age: 24.0 ± 8.2 years; range 13.1–48.0 years) were selected to have mini-implants placed in the posterior buccal alveolar bone to act as anchorage during orthodontic treatment. Computed tomography scans were taken for diagnostic imaging of the area surrounding the site of implant placement in 0.125 mm slices. Cortical bone thickness was measured from 1 to 15 mm below the alveolar crest at 1-mm intervals. To reduce error measurements were made by one examiner and repeated at least twice.

Results: The mean cortical bone thicknesses ranged from 1.09 to 1.62 mm in the maxilla and 1.59 to 2.66 mm in the mandible and tended to increase with height. All the measurements in the maxilla were significantly smaller than those in the mandible ($P<0.001$). The cortical bone in the mandible of the adolescents was significantly thinner than in adults between 3 and 8 mm ($P<0.05$). No significant difference according to age was seen in the maxilla. The cortical bone was significantly thinner in females than in males in the region of the attached gingiva in the maxilla mesial to the first molar ($P<0.05$). No difference was seen in the mandible according to gender.

Conclusions: The results suggest that owing to its good bone quality, the mandible is a suitable preparation site for mini-implants, while the maxilla might be insufficient at shallow locations. Regardless of age, the initial stability of mini-implants in shallow locations in the maxilla of women should be considered.

Comment: The last few years has seen an explosion in the use of mini-implants for orthodontic anchorage. This paper confirms that bone density varies according to location and in the case of the maxilla, offers advice on the best positions for placement of these devices.

Orthodontics and paediatric dentistry

Sucking habits in childhood and the effects on the primary dentition: findings of the Avon Longitudinal Study of Pregnancy and Childhood. *Int J Paediatr Den* 2008; 18: 178–88
Duncan K, McNamara C, Ireland AJ, Sandy JR

Objective: This aim of this longitudinal observational study was to determine the prevalence of non-nutritive sucking habits and the effects this has on the developing primary dentition in children within a UK population.

Methodology: A randomly selected cohort of children from the Avon Longitudinal Study of Parents and Children (ALSPAC) study, who had been monitored periodically via questionnaires and clinic visits, were chosen. Questionnaire data on non-nutritive sucking habits (e.g. digit and dummy sucking) were collected on the children at 15 months, 24 months, and 36 months of

age. Standard orthodontic examinations were also performed on the same children at 31 months, 43 months and 61 months of age by one primary examiner.

Results: A total of 867 children attended all three clinical examination clinics. At 15 months, 522 children (63.2%) had a reported sucking habit; 310 (37.6%) used just a dummy, 188 (22.8%) used a digit and 24 (2.8%) used both. By 36 months, this sucking had reduced to 40%, with similar prevalence of dummy (18.3%) and digit sucking (18.9%). The decline in dummy use was more rapid than the decline in digit sucking over the 21-month period. Both habits had effects on the developing dentition, most notably in upper labial segment alignment and the development of anterior open bites and posterior crossbites.

Conclusions: This study showed that the majority of children had non-nutritive sucking habits up until 24 months of age. Both digit and dummy sucking were associated with observed anomalies in the developing dentition. The persistent digit-sucking habit, if still present at 36 months, had the strongest associations with the presence of a posterior crossbite at 43 and 61 months.

Comment: This study confirms the effects that certain habits can have on the developing teeth and occlusion. Fortunately, it appears that most habits cease by the age of five and hence their impact during occlusal development maybe transient.

Evidence-based orthodontics

Systematic reviews in orthodontics: what have we learned? *Int Dent J* 2008; 58: 10–14
Fleming PS, DiBiase AT

Objective: The purpose of this article was to review the current orthodontic literature and identify systematic reviews (SRs) of orthodontic-related topics and to appraise and summarise them.

Methodology: All SRs and meta-analyses related to human orthodontic-related studies published between 1st January 2000 and 31st January 2007 were identified using both hand searches and electronic searches of The Cochrane Library (including the Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects (DARE), the Cochrane Central Register of Controlled Trials, Cochrane Database of Methodology Reviews, Cochrane Methodology Register, Health Technology Assessment Database and NHS Economic Evaluation Database), MEDLINE, PubMed, EMBASE and Web of Science electronic databases.

Results: A total of 51 orthodontic-related systematic reviews were identified in the defined period. Of these, 15 reviews (29%) were reported to have an insufficient standard of methodology and failed to reach any conclusions. Of the remaining reviews, seven main areas were identified as having provided evidence-based conclusions, these being: diagnosis and treatment planning; treatment mechanics; functional appliances; cleft lip and palate: aetiology, impact and management; oral appliances in obstructive sleep apnoea; iatrogenic effects and preventive measures and stability/retention. However, conclusions in many of these remaining reviews relied on secondary levels of evidence.

Conclusions: Many SRs in orthodontic-related areas have produced interesting results. However, there remains an unacceptably high number which continue to be inconclusive as a result of deficiencies in the review process.

Comment: This article is somewhat disappointing as it highlights the fact that despite all the hype surrounding evidence-based orthodontics and the supposed 'robustness' of SRs, there is still a lack of good quality evidence in the orthodontic field. However, efforts are continuing at the research level and the number of orthodontically related SRs is increasing.

Orthodontics and tooth movement

An anti-c-Fms antibody inhibits orthodontic tooth movement. *J Dent Res* 2008; 87: 396–400
Kitaura H, Yoshimatsu M, Fujimura Y, Eguchi T, Kohara H, Yamaguchi A, Yoshida N

Objective: Forces generated for orthodontic tooth movement induce osteoclastogenesis *in vivo*. It has recently been reported that administration of an antibody against the macrophage-colony-stimulating factor (M-CSF) receptor c-Fms blocks osteoclastogenesis and bone erosion induced by tumour necrosis factor-α (TNF-α) administration. The aim of this animal study was to investigate the effect of an anti-c-Fms antibody on mechanical loading-induced osteoclastogenesis and osteolysis in an orthodontic tooth movement model.

Methodology: Eight-week-old wild-type (TNF receptor 1- and 2-deficient) mice were fitted with an orthodontic appliance consisting of a NiTi closed-coil spring inserted between the upper incisors and the upper left first molar tooth using an activation force level of approximately 10 g. Anti-c-Fms antibody was injected daily for 12 days into the buccal gingiva close to upper left first molar during tooth movement. Following this, the mice were

prepared in the laboratory for histological observation and the distance the tooth moved was evaluated using a stereoscopic microscope.

Results: TNF-α significantly inhibited the amount of orthodontic tooth movement after two days. By day 12, tooth movement had increased again. The anti-c-Fms antibody markedly reduced the number of osteoclasts *in vivo* and inhibited TNF-α-induced osteoclastogenesis *in vitro*.

Conclusions: The findings of this study suggest that M-CSF plays an important role in mechanical loading-induced osteoclastogenesis and bone resorption during orthodontic tooth movement mediated by TNF-α.

Comment: This paper is a useful addition to the scientific literature increasing our understanding of the complex biomechanical roles of various mediators on osteoclastogenesis and bone resorption during orthodontic tooth movement.