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 Fiona Ryan and Professor Nigel Hunt.

Implants

Success rate of palatal orthodontic implants: a prospective longitudinal study. *Clin Oral Impl Res* **2008; 19: 665–9**
Männchen R, Schätzle M

Aims: The purpose of this prospective cohort study was to assess the survival and success rates of palatal implants.

Materials and methods: Seventy patients (56 female, 14 male; age 25–6 $\pm$ 10–8 years) receiving Orthosystem® (Straumann AG, Basel, Switzerland) palatal implants from March 1999 to November 2006 were included. The indication was established according to the required anchorage for orthodontic therapy. All implants were placed in a mid-sagittal, median or paramedian palatal location by the same surgeon. They were orthodontically loaded after a healing period of 8–16 weeks (Mean: 12.8 weeks).

Results and discussion: Of the initially 70 consecutively admitted patients, two implants in two patients were not primary stable after installation and had to be removed. Of the 70, 67 implants or 95.7% osseointegrated successfully and were loaded actively and/or passively for approximately 19 months. Only one implant of the 67 osseointegrated implants lost its stability under orthodontic loading. By the time of re-evaluation, 20 palatal implants were still used for orthodontic therapy, while 46 implants had been removed after completed orthodontic therapy. By only analyzing those, the success rate of the initially installed implants was 92%.

Conclusions: Orthodontic palatal implants with a rough surface are predictable and highly reliable devices for a multitude of maxillary orthodontic treatment options. The survival and success rates for palatal orthodontic implants are comparable to dental implants installed for dental prostheses.

Comment: This paper adds to the growing literature on temporary anchorage devices (TADS) and reinforces the evidence that palatal implants are a reliable and acceptable alternative to other anchorage reinforcing techniques in selected cases. The survival and success rates were found to be excellent. The authors go on to say that these devices provide reliable absolute anchorage and thus can be considered to be superior to any orthodontic tooth-borne device. However, this study did not assess any dental parameters or anchorage provision or loss and no details were provided on the type of tooth movement the implant was used to support. The authors conclude that palatal orthodontic implants demonstrate success rates comparable to dental implants inserted for prosthetic rehabilitation but, by their own admission, as they are used for different purposes and orthodontic devices are, by definition, temporary, such comparison is of limited relevance. The authors conclude by warning that this type of skeletal anchorage has no skeletal growth modification effect and thus must carefully be considered as an alternative to extraoral anchorage or functional appliances in growing individuals.

Cleft lip and palate

Effect of infant orthopedics on facial appearance of toddlers with complete unilateral cleft lip and palate (Dutchcleft). *The Cleft Palate Craniofac J* **2008; 45: 407–13**
Bongaarts CAM, Prahl-Andersen B, Bronkhorst EM, Spauwen PHM, Mulder JW, Vaandrager JM, Kuijpers-Jagtman AM

Aims: To evaluate the effect of infant orthopedics (IO) on facial appearance of 54 patients with unilateral cleft lip and palate (UCLP) aged 4 and 6 years.

Design: Prospective two-arm randomized controlled clinical trial in three Cleft Palate Centres in the Netherlands (Dutchcleft-trial).

Materials and methods: Patients were divided randomly into two groups. Half of the patients (IO+) had a plate

until surgical closure of the soft palate at the age of ± 52 weeks; the other half (IO−) received no intervention. Facial appearance at 4 and 6 years of age was assessed on full face photographs and photographs showing only the nose and mouth. Ratings were performed on a VAS-scale by professionals and laymen.

Results: At 4 years of age the full face pictures of IO+ children were scored to be more attractive than those of IO− children. However, this difference had disappeared at 6 years of age. At the age of 6, only professionals saw a significant difference on nasolabial photographs between IO+ and IO−. Regression analysis showed a minor effect of occlusion, lip revision, or type of nose reconstruction on the aesthetic results.

Conclusions: IO had a positive effect on full facial appearance of UCLP children at the age of 4 years, but at the age of 6, only professionals saw a positive effect of IO on the nasolabial photographs. This is irrelevant for UCLP patients since they deal with laymen in their daily life.

Comment: This multicentre, randomised controlled trial reports on the effects of PSO on facial appearance in patients with unilateral cleft lip and palate. The same authors have previously published the effects of PSO on arch dimensions, occlusion, feeding and nutritional status, and speech and found no difference for any variable between treatment and control groups. Similarly, this study reports no perceptible difference in facial appearance between the two groups by the lay population. The sample is limited to white patients, with parents fluent in Dutch, and patients with unilateral cleft lip and palate, and no sample size calculation was performed. Thus the results should be interpreted with some caution. However, this valuable research finally addresses some important questions which have remained unanswered for years.

Auto Transplantation canines

5-year longitudinal study of survival rate and periodontal parameter changes at sites of maxillary canine auto-transplantation. *J Periodontol* 2008; 79(4): 595–602
Arikan F, Nizam N, Sonmez S

Aims: Although dental transplantation is an accepted treatment modality, few studies have evaluated the prognosis for autotransplantation of maxillary canines, and changes in clinical periodontal parameters still need to be demonstrated. The objectives of this long-term study were to evaluate the prognosis and changes in clinical attachment level (CAL), probing depth (PD), soft tissue recession (REC), and radiographic bone level

changes between years 1 and 5 for autotransplanted maxillary canines.

Materials and methods: Thirty subjects with 32 impacted canines were scheduled for transplantation. Transplanted teeth were splinted for 4 weeks, and endodontic treatments were performed within 1 year after the operation. Radiographs were taken, and PD and CAL were measured for up to 5 years. Progressive root resorption was observed in two teeth, and one tooth was extracted during year 4.

Results: The survival rate was 93.5%. CAL and PD tended to increase slightly at all sites, especially at palatal sites after transplantation, whereas the greatest CAL and PD were found at approximal sites, and REC was the same as natural teeth.

Conclusions: Maxillary canine transplantation can be a reliable treatment alternative. Clinical measurements demonstrated long-term stability. Based on the literature and the present findings, maxillary canine transplantation can be suggested as a promising treatment modality.

Comment: This interesting prospective study examines the success and survival rates as well as periodontal condition of 32 autotransplanted permanent maxillary canine teeth. The survival rate of this cohort was 93.5% at 5 years with no statistically significant differences in the periodontal parameters measured over time. The authors are not aware of any other study which examines this latter aspect of transplanted teeth. The surgical technique is described in detail and this highlights the technique-sensitive nature of the procedure, which undoubtedly influences success. In addition, the procedure relies on enough space being available for the tooth which may not always be the case if the deciduous canine has been extracted or lost. The sample size is small and the follow up period is relatively short (5 years). It would be interesting to follow these teeth up in the longer term and to examine patients' perceptions of treatment and outcome compared with the lengthier alternatives. Nonetheless, this article highlights that autotransplantation is a viable alternative for the treatment of impacted canines.

Radiology

Accuracy of three-dimensional (3D) craniofacial cephalometric landmarks on a low-dose 3D computed tomography. *Dentomaxillofac Radiol* 2008; 37: 261–7
Olszewski R, Reychler H, Cosnard G, Denis JM, Vynckier S, Zech F

Aims: The aim of this paper was to compare the accuracy of cephalometric landmark identification using three-dimensional CT (3D-CT) surface rendering with

'high-dose' (200 mAs) and 'low-dose' (35 mAs) CT protocols. The absorbed dose levels for radiosensitive organs in the maxillofacial region during the exposure for both 3D-CT protocols were also measured.

Materials and methods: The study population consisted of 15 human dry skulls examined with spiral 3D-CT. Twelve cephalometric anatomical landmarks at seven sites were identified on the 3D-CT surface renderings by two observers independently, twice each, using high-dose and low-dose protocols. In total, 1440 imaging measurements were made. Thermoluminescent dosemeters (TLDs) were placed at ten sites around the thyroid and submandibular glands and the eyes in an Alderson phantom for measuring the absorbed dose levels.

Results: The intra-observer mean distances between 3D landmarks were smaller for all sites with the high-dose protocol ($P=0.37$). There was a significant difference among the observers ($P=0.001$). Inter-observer mean distances between 3D landmarks were smaller for four of the seven sites with the low-dose protocol. However, the global inter-observer mean distances between 3D landmarks for all sites were smaller with the high-dose protocol ($P=0.028$). The low-dose protocol reduced the radiation dose to the thyroid by 6.12, to the submandibular salivary glands by 5.91 and to the eye by 5.44, resulting in a global reduction factor of 5.71.

Conclusions: The accuracy in the landmark's identification was maintained when the milliampere-second values were reduced from 200 to 35 mAs. We recommend use of the low-dose protocol for clinical 3D-CT cephalometric applications.

Comment: The authors found that the accuracy of landmark identification was maintained when reducing the dose but that the estimation error was globally more important with the low dose protocol. It would have been interesting to use commonly used cephalometric landmarks instead of those used in this study and to compare accuracy of identification with conventional 2D imaging. With the advent and wide-spread use of the low dose cone-beam CT technique, this study is perhaps of limited relevance to the orthodontic community. It may be relevant in cases of craniofacial deformity or where access to CBCT is limited, where this low-dose spiral CT protocol is an alternative. The authors finish with a timely warning that radiation-induced effects such as carcinogenesis are not dependent on a minimum threshold of exposure, and radiation should always be kept as low as reasonably practicable and all exposures justified. The study highlights the need to make full diagnostic use of all images when taken.

Root resorption

Periodontal parameters and cervical root resorption during orthodontic tooth movement. *J Clin Periodontol* **2008; 35(6): 501–6**
Giannopoulou C, Dudic A, Montet X , Kiliaridis S, Mombelli A

Aims: To assess the relationship between periodontal parameters and cervical root resorption in orthodontically moved teeth.

Materials and methods: In a standardized experimental tooth movement in 16 periodontally healthy subjects, 29 premolars were tipped buccally for 8 weeks. Eighteen contralateral premolars not subjected to orthodontic movement served as controls. Plaque Index (PI), Gingival Index (GI), probing depth and bleeding on probing were assessed three times before and six times during the experimental phase. Teeth were extracted and scanned in a micro-computed tomography scanner. The presence or absence, and the severity of cervical root resorption were evaluated on the three-dimensional reconstruction of the scans by two calibrated examiners.

Results: Overall, periodontal parameters were not different between the test and the control teeth. Clear signs of buccal cervical resorption were detected on 27 of 29 orthodontically moved teeth and on one control tooth. Ten subjects had perfect oral hygiene and no gingivitis, whereas six subjects showed a moderate level of plaque and gingivitis ($>20\%$ occurrences of PI or GI with >0). No relationship could be demonstrated between resorption and periodontal parameters.

Conclusions: Nearly all orthodontically moved teeth showed signs of cervical resorption. Periodontal parameters were unrelated to this important side effect of orthodontic treatment.

Comment: The aim of this experimental controlled study was to assess whether the degree of cervical root resorption is correlated to certain periodontal parameters. There were no differences between the control and experimental groups for any of the periodontal parameters assessed, and thus the authors conclude that periodontal parameters and cervical root resorption are unrelated. However, all patients exhibited good oral hygiene and periodontal health so, by the authors own admission, the possibility that the resorption may have been worse with poor oral hygiene or periodontal disease cannot be ruled out. Also, there is no mention of a sample size calculation. This study highlights the fact that resorption is a 3D phenomenon and its extent

needs to be quantified with precision. They advocate micro-CT scanning as the gold standard. Worryingly, clear signs of cervical root resorption were evident on almost all of the experimental teeth, and most were in the severe category. However, moderate cervical resorption was also found in 33% of the control group, highlighting the multifactorial aetiology of root resorption.

Biology

Detection of gingival crevicular fluid cytokines in children and adolescents with and without fixed orthodontic appliances. *Acta Odontol Scand* **2008; 66(3): 169–73**
Giannopoulou C, Mombelli A, Tsinidou K, Vasdekis V, Kamma J

Aims: To study the expression of IL-1β, IL-4, and IL-8 in the gingival crevicular fluid (GCF) of children, adolescents, and young adults with and without fixed orthodontic appliances.

Material and methods: Eighty systemically healthy children and adolescents participated in the study: 56 aged between 8 and 16 years without any orthodontic appliance (Group A) and 24 aged between 10 and 20 years having worn fixed orthodontic appliances for at least 12 months (Group B). Clinical examination included presence or absence of plaque, probing depth, bleeding on probing, and gingival overgrowth. GCF was collected by means of Durapore strips from four randomly selected sites per subject. The contents of interleukin-1 beta (IL-1β), interleukin-4 (IL-4), and interleukin-8 (IL-8) were detected by ELISA, measured as total amounts (pg/30 s) and expressed in log scale.

Results: Statistically significant differences were noted for the mean log IL-1β, IL-4, and IL-8 between the two groups: Group B showed significantly higher mean levels in log IL-1β and log IL-8 compared to Group A. Mean levels of log IL-4 were lower in Group B, although they did not reach statistical significance. Furthermore, mean levels of log IL-1β and log IL-8 were associated with bleeding sites ($P<0.001$) and gingival overgrowth, while mean level of log IL-4 was associated with non-bleeding sites and no gingival overgrowth ($P<0.001$).

*Conclusion*s: Our findings suggest that fixed orthodontic appliances result in an increase in the expression of IL-1β and IL-8. This may reflect biologic activity in the periodontium during orthodontic tooth movement.

Comment: This meticulously performed study examines the inflammatory and immune mediators present in gingival crevicular fluid (GCF) during orthodontic treatment. GCF reflects the immune and inflammatory reactions derived from host-parasite interactions and biomechanical stress. It is a non-invasive alternative to clinical and microbiological studies. This study assesses the amount of IL-1β, IL-4, IL-8 in GCF using enzyme-linked immunoadsorbent assays (ELISA) in patients with orthodontic appliances compared with a control group without appliances. The increased expression of IL-1β and IL-8 might reflect the host response to the orthodontically induced local inflammation.