The reliability of using postero-anterior cephalometry and cone-beam CT to determine transverse dimensions in clinical practice

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Aim: This study primarily aimed to assess the accuracy of classically-advocated reference points for the measurement of transverse jaw-base and dental relationships using conventional Postero-Anterior Cephalometry (PAC) and Cone-Beam Computed Tomography (CBCT).

Method: PAC and CBCT images were collected from 31 randomly selected orthodontic patients (12 males, 19 females), all of whom had a full permanent dentition. The transverse widths of the maxilla, mandible and the dentition were measured using reference points on both image modalities. Confidence intervals, intra-class coefficients and Bland Altman plots were used to assess the measurement differences derived from the two acquirement methods.

Results: Measurements on PAC and CBCT images demonstrated statistically significant differences in the majority of the assessed variables. The interjugal (J-J) width was one of only two variables which did not demonstrate a statistically significant difference on image comparison. The mean differences of the antegonial width (Ag-Ag) (-4.44mm, 95% CI -5.38 to -3.51) represented the greatest difference between the imaging techniques. The application of these points to a transverse skeletal analysis (J-J/Ag-Ag ratio) revealed that five of the 31 subjects (16%) recorded ‘false positive’ readings according to the derived data.

Conclusion: It is recommended that clinicians are cautious when interpreting and making decisions related to transverse dimensions derived from a PAC. The PAC has a higher tendency to falsely identify individuals who require maxillary expansion procedures based on conventional clinical criteria. The errors primarily associated with identifying structures which represent the width of the mandible are significant in both PAC and CBCT techniques and require further investigation. It is postulated that the confounding effects of overlying soft tissues have a significant impact on a clinician’s ability to identify relevant landmarks.

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A qualitative investigation of RANKL, RANK and OPG in a rat model of transient ankylosis
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Introduction: Previous studies have found ankylosis occurs as a part of the inflammatory process of aseptic root resorption initiated in a rat model.1 The physiologic mechanisms behind the development of dentoalveolar ankylosis and healing response are still unclear. While receptor activator of nuclear factor-κβ ligand (RANKL), receptor activator of nuclear factor-κβ (RANK) and osteoprotegerin (OPG) have gained momentum in the understanding of resorption, no study to date has investigated their role in dentoalveolar ankylosis.

Aims: The aims of this study were to investigate if, and when, ankylosis occurred in the rat PDL, whether the resolution of ankylosis occurred with time and, finally, to observe the expression of RANKL, RANK and OPG during the ankylotic process.

Materials and methods: Dry ice was applied for 20 minutes to the upper right first molar crown of 15 eight-week-old, male Sprague-Dawley rats. An additional three rats served as untreated external controls. Groups of three rats were sacrificed after the thermal insult on day 0, 4, 7, 14 and 28 respectively. Each maxilla was dissected out and processed for histological examination and RANKL, OPG and RANK immunohistochemistry.

Results: By the use of light microscopy and H&E staining, no ankylosis was detected in the external control group and the experimental groups at days 0 and 4. On day 7, disruption within the periodontal ligament was observed in the interradicular region and the initial signs of ankylosis were seen in the form of finger-like projections extending from the alveolar bone towards the cementum. Fourteen days after the thermal insult, all animals exhibited extensive ankylosis that spanned the entire interradicular periodontal space. At 28 days, the development of ankylosis appeared to have ceased and repair was observed, together with an intact periodontal ligament in all but one rat. Positive staining results were obtained with RANKL, RANK and OPG antibodies. The expressions of RANKL, RANK and OPG were similar in the external control group, 0-, 4-, and 28-day experimental groups. In the 7- and 14-day experimental groups, RANKL, RANK and OPG were expressed in the blood vessels within the ankylotic regions.

Conclusions: During the development of ankylosis and its resolution, it was concluded from their simultaneous presence that there is a complex interaction between RANKL, RANK and OPG that requires further investigation.

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Changes in maxillary molar pulp blood flow during orthodontic intrusion
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Introduction/Objective: The aim of this prospective study was to evaluate the effects of maxillary first molar intrusion on pulpal blood flow (PBF) in humans as recorded by laser Doppler flowmetry (LDF). Materials and methods: Maxillary first molars of 16 participants were divided into two groups. In the study group, 20 teeth in 10 participants were subjected to an intrusive force of 100 g delivered from mini-implants for 6 months. A control group of 6 subjects (12 teeth) received no orthodontic treatment. LDF measurements were recorded at baseline and at 3 days, 3 weeks, 3 months and 6 months during intrusion. Data was analysed using the Wilcoxon Signed Rank and Mann-Whitney U tests, with a level of p < 0.05 considered statistically significant.

Results: No significant changes in PBF perfusion units (PU) were observed in the control group over the course of the study. However, PBF in the study group was significantly higher at T0 (8.7 ± 0.9 PU) when compared with T1 (6.1 ± 0.6 PU, p < 0.001) and T2 (6.0 ± 0.6 PU, p < 0.001). PBF did not vary significantly between T1 and T2 (p = 0.073) or between T3 and T4 (p = 0.262). Moreover, PBF at the end of the study (T4) was similar to baseline PBF values for both groups (study group: p = 0.687; control group: p = 0.525).

Conclusions: Despite significant short-term regressive changes in pulpal tissue during continuous molar intrusion with mini-implants and an applied force of 100 g, blood vessel function was maintained throughout intrusion, as indicated by LDF measurements of PBF, which tended to return to baseline values by the end of the observation period. These results highlight the changes that can occur in molar vascularity, especially during six months of intrusion.

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The effects of denervation and formoterol administration on facial growth
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Objective: To identify and demonstrate possible alterations of skeletal structures which might follow either unilateral surgical denervation of the masseter muscle, unilateral intramuscular injection of formoterol directly into the masseter muscle, or intramuscular formoterol injection after surgical denervation.

Materials and methods: Male Sprague Dawley rats (N = 16; four weeks of age) were prepared as four groups: 1. surgical sham + saline injection into the masseter muscle (sham); 2. surgical denervation of the masseter muscle only (den.); 3. surgical denervation of the masseter muscle plus intramuscular formoterol injection into the affected muscle (den.+form.); 4. intramuscular formoterol injection into the masseter muscle only (form.). The specimens were submitted for CT examination, the skulls and hemimandibles were photographed and measurements of craniofacial bones were made.

Results: In this relatively small sample, comparisons between non-experimental and experimental sides revealed differences, both within the groups and for the same measurements between groups, with the den. and den.+form. groups showing the most change. Relative increases in the gonial angle shown in these groups occurred bilaterally, with the change on the experimental side always greater in magnitude than the change on the contralateral side.

Conclusions: Surgical denervation of the masseter muscle leads to an alteration in the size and shape of the skeletal structures close to the zygoma and the mandible. The intramuscular injection of formoterol into denervated masseter muscle seems to limit this skeletal alteration after surgical denervation.

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A three-dimensional evaluation of Māori and New Zealand European faces
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Objective: Māori patients are often inappropriately treated using Caucasian norms, despite
obvious differences in facial morphology. There is currently very little data concerning the
nature and/or magnitude of these differences in facial features. The objective of the present
study was therefore to evaluate the facial features of Māori and New Zealand (NZ)
Europeans.

Methods: Two convenience samples of 30 Māori and 30 NZ Europeans, evenly matched for
age and gender, were recruited from amongst students of the University of Otago, New
Zealand. Using a 3D white-light scanner, 12 facial scans were taken of each participant,
which were then merged to form a single 3D image of the face. Prior to scanning, round
markers were fixed to the skin in order to facilitate the localisation of facial anthropometric
points and from which vertical, sagittal, and transverse measurements were assessed from
the 3D facial image. Univariate and multivariate analyses of variance were used to test for
differences between the two groups before and after adjusting for body mass index (BMI).
Results: Significant differences were found in vertical, sagittal, and transverse facial
dimensions, before and after adjusting for BMI. The overall face of Māori was significantly
larger than that of NZ Europeans, although the facial proportions were generally similar.
However, Māori had a broader face, more anterior position of the chin and reduced facial
convexity in comparison with NZ Europeans (p < 0.01).

Conclusion: Māori have markedly different sagittal facial features compared with NZ
Europeans. These distinctive features may reflect important differences in environmental
and genetic influences between the two populations. The findings from the present study
may assist the clinician in the treatment planning and assessment of facial dysmorphology
in these ethnic groups.

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Effects of low-intensity pulsed ultrasound on bone formation after the expansion of the inter-premaxillary suture in rats: a histologic and immunohistochemical study

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Background: Orthodontic maxillary expansion is a commonly-performed treatment approach to correct transverse maxillary deficiencies by separating the mid-palatal suture. To obtain a successful treatment result and prevent relapse, the expanded maxillary sutures require maintenance by means of qualified bone reorganisation.

Aim: To assess the effects of low-intensity pulsed ultrasound (LIPUS) on sutural bone formation after the expansion of the inter-premaxillary suture in rats.

Methods: Sixteen male Wistar rats, 6 to 8-week old, were used. The expansion appliance comprised a helical spring fabricated from 0.014 inch stainless steel wire (Dentaurum, Ispringen, Germany). The rats were divided into two equal groups and randomly assigned to the LIPUS treatment group or a sham-operation group. LIPUS was delivered via a 2.5 cm diameter ultrasound transducer (Exogen, Smith and Nephews, Inc., Memphis, TN, USA) for 20 minutes per day during 7 days of postexpansion retention. Following retention, the rats’ maxillae were surgically removed and histologic and immunohistochemical specimens were prepared and examined.

Results: The number of osteoblasts and blood vessel dimensions in the ultrasound group increased but was not significant, compared with the control group. A statistically significant difference in osteocalcin, VEGF and TGF-β immunoreactivities (p < 0.01) was found in the area of the mineralising tissue. Only VEGF immunoreactivity was significant between two groups (p < 0.01) in the fibrous tissue area.

Conclusions: The area of mineralising tissue in the LIPUS-applied group expressed activity markers for osteocalcin, VEGF and TGF-β compared with a surrounding area of fibrous tissue. Cellular activation in the LIPUS group was greater than that of controls. Therefore, LIPUS may be accepted as a useful approach to enhance sutural bone formation.

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Severity and outcome assessments of patients undertaking surgical orthodontic treatment

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Background: Combined orthognathic-orthodontic treatment can be lengthy and expensive. It is therefore important to evaluate the effectiveness of proposed treatment and the likely outcomes. Objectives: To determine the demographic and surgical details of patients who received orthognathic-orthodontic treatment at Christchurch Hospital, New Zealand, and to assess treatment using the Severity and Outcome Index (SOI).

Methods: An observational and retrospective study was conducted of patients who received surgical orthodontic treatment between 2005 and 2012 at Christchurch Hospital. Pre- and post-treatment lateral cephalometric radiographs of 93 patients were evaluated. Seven cephalometric parameters were assessed using the Severity and Outcome Index. A severity score ranged from 0 for the most severe to 7 for the least severe, while the outcome score ranged from 0 for the worst to 7 for the best outcome.

Results: Class II patients had a severity score of 3.4 and the best outcome score of 6.2. Class III patients had a severity score of 3.3 and an outcome score of 6.1. Patients with an anterior open bite (AOB) had the worst severity score of 3.0, and the worst outcome score of 5.9. The overall treatment outcome scores for all groups were statistically significantly greater than the severity scores, which increased from 3.4 to 6.1 (p < 0.05).

Conclusions: Favourable outcomes were achieved for a group of patients with a high need for treatment. Christchurch Hospital appeared to be treating cases of increased severity and gained better treatment outcomes when compared with a United Kingdom (UK) national audit.

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In vitro spectrophotometric evaluation of Vivera® clear thermoplastic retainer discolouration

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Aims: To investigate the in vitro effect of different staining solutions on the colour stability of Vivera® retainers.

Methods: Thirty flat specimens fabricated using the Vivera® material (Align Technology Inc., CA, USA) were assigned into five Groups (A, B, C, D and E) and immersed at 37°C in solutions of distilled water (control), coffee, tea, red wine, and Coca-Cola®. The CIE colour parameters (L*, a*, b*) of each specimen were measured before immersion (T0) and after 12 hours (T1), three days (T2) and seven days (T3) of solution exposure. Colour differences (ΔE) between the interval groups were calculated.

Results: Significant differences were observed concerning (i) L* between T3 and T0, T1 and T2 for Group B; (ii) a* between T0 and T1, T2 and T3 for Groups B, C, D and E, as well as between T1 and T2 for Group C; and (iii) b* between T0 and T1, T2 and T3 for Group B and between T0 and T2 and T3 for Group C. The differences between ΔE(T1-T0), ΔE(T2-T0) and ΔE(T3-T0) were statistically significant for Groups B and C, as well as the difference between ΔE(T1-T0) and ΔE(T2-T0) for Group D.

Conclusions: Coffee, tea and red wine caused visible changes in the retainers’ colour.

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Accelerating orthodontic tooth movement with the aid of periodontal surgery – the practitioner viewpoint
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Introduction: There has been a revival of interest in the acceleration of orthodontic tooth movement (OTM) by inducing injury to dentoalveolar cortical bone. Termed corticotomy, the procedure offers an advantage to adult patients whose bone metabolism is such that any reduction in treatment time would be welcomed. The procedure has been refined for over 100 years and recent research indicates treatment duration may be reduced often by as much as a third, but it is not clear how widely the method is applied in practice. For the procedure to be successful, careful interdisciplinary management by orthodontists and periodontists is required. However, information regarding the attitude and knowledge of practitioners and the frequency of the procedure performed in Australia and New Zealand is lacking.

Methods: A questionnaire was formulated and tested in a pilot study on postgraduate orthodontic and periodontic students at The University of Adelaide. As a consequence of the responses, the wording of several questions was clarified and the sequence modified to produce the final format. Separate questionnaires were developed for specialist orthodontists and periodontists in keeping with their different backgrounds and were distributed at two relevant conferences.

Results and conclusions: The number of practitioners who had been involved with at least one corticotomy per annum was low for orthodontists (12%) and periodontists (18%). The majority of those surveyed believed that more research was required on corticotomy-facilitated OTM and would not recommend the procedure to patients without greater investigation of the technique. More than half of the sampled orthodontists indicated that they would never recommend corticotomy-facilitated orthodontics to their patients. The minority who were willing to recommend the procedure would limit involvement to adult patients, the management of ankylosed teeth, impacted canines and patients susceptible to root resorption. Over 90% of the sampled periodontists believed that there were adverse side effects.

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Body dysmorphic disorder and orthodontics – an overview for clinicians
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Introduction: Patients with body dysmorphic disorder (BDD) often seek aesthetic medical treatment including orthodontics to correct their perceived physical defects. When the disorder pertains to the dentofacial region, it is important for orthodontists to be familiar with this condition.

Objective: The purpose of this article is to provide an overview of the current knowledge on BDD and its relationship to orthodontics.

Method: PubMed, Scopus, Science Direct, and Google Scholar databases were searched for publications relating to BDD and orthodontics. Further articles were sourced from the reference lists of the articles identified through the search.

Results: The literature recommends that orthodontic patients suspected of having BDD should be referred to a psychiatrist for a definitive diagnosis and subsequent management. However, this may be difficult to implement in clinical practice. Management by a psychiatrist could include pharmacotherapy and cognitive behavioural therapy. There is still debate as to whether orthodontic treatment should be provided for these patients.

Conclusion: As healthcare workers providing aesthetic treatment to patients, orthodontists should be aware of BDD and its implications. Risks include repeated requests for unnecessary treatment, dissatisfaction with the result and thus potential for litigation. BDD still remains a challenge to diagnose, and further research is needed to determine the appropriate management of orthodontic patients suffering from the disorder.

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Orthodontic treatment in Cherubism: an overview and a case report
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Introduction: Cherubism is a rare hereditary disease that frequently manifests as a painless enlargement of the mandible and/or maxilla. The disease usually progresses rapidly during the first and second decades of life but it is self-limiting and often regresses. Although few orthodontic case reports describing cherubic patients exist, the timing and extent of surgical intervention is controversial.

Aim: This present paper aims to review the treatment literature and provide a case report of a patient who underwent orthodontic/surgical management.

Methods: The patient presented with severe cherubism in her late teenage years; her main complaint was poor facial and dental appearance. Multiple teeth were missing and those present demonstrated significant preoperative root resorption.1 Treatment consisted of orthodontic alignment of the upper anterior teeth and a recontouring osteotomy.

Results: Confirmed by the patient, the combination approach led to a significant improvement in facial aesthetics and better selfesteem. Tooth movement through the osseous lesions was uneventful and no further root resorption was observed.

Conclusion: Orthodontic treatment may be undertaken in those affected by Cherubism even with pre-existing idiopathic root resorption, but patients need to be appropriately informed and consented.

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Clinical problems with a double tooth and a macrodont in the maxillary anterior area: a case report
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Background: Fusion is defined as the union between dentine and/or enamel of two normally separated teeth. Gemination is the cleavage of the forming dental germ to produce two partial teeth. The distinction between the conditions is often determined by the number of teeth present. However, this can be confused if supernumerary teeth are considered.

Aim: The present case report describes the treatment of a patient who presented with dental fusion and macrodontia involving both upper central incisors. Besides the central incisors displaying characteristics of macrodonts, tooth 21 also showed aspects of fusion.

Methods: Management consisted of the extraction of 11 and 21 and orthodontic mesialisation of the maxillary dentition. Treatment was planned in two phases and at the end of the orthodontic phase, the upper anterior teeth were to be reshaped using composite resin.

Results: Orthodontic space closure is a treatment option in the clinical management of an extracted maxillary central double and/or macrodontic tooth. As no permanent teeth were absent, it was presumed that the fusion of 21 occurred with a supernumerary tooth.

Conclusions: Multidisciplinary treatment following the extraction of maxillary central incisors is reported with special attention to the orthodontic and restorative considerations required to improve the aesthetic outcome.

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Mini-implant-borne Pendulum B appliance for maxillary molar distalisation: design and clinical procedure
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A treatment objective of upper molar distalisation may often be required during the correction of a malocclusion. Distalisation is not only indicated for the management of Class II patients, but also for Class III surgery patients who require decompensation in the upper arch if upper incisor retrusion is needed. Unfortunately, most conventional intra-oral devices for non-compliance maxillary molar distalisation experience anchorage loss. A Pendulum type of appliance and a mini-implant-borne distalisation mechanism have been designed which can be inserted at chair-side, without a prior laboratory procedure and immediately after mini-implant placement. For re-activation purposes, a distal screw may be added to the Pendulum B appliance.

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A simple technique for the direct bonding of a lingual retainer: a clinical hint
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The direct bonding of a fixed wire retainer often poses clinical difficulties. While there are several possible techniques, the present paper describes a simple method employing a ball clasp (S handle) to assist in the stabilisation of the wire to be attached. The advantages and disadvantages are indicated.

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