## 62 Soft Tissue Response Following Class II Division 1 Surgical Treatment. M TEH*, M YOW (National Dental Centre, Singapore)

Objective: To assess soft tissue profile changes and responses to hard tissue movements in patients who had undergone orthognathic surgery.
Method: This study examined 52 lateral cephalometric radiographs of a cohort of 26 Chinese patients who had orthognathic surgery for Class II Division 1 malocclusion. The radiographs were classified as T1 (after completion of pre-surgical orthodontics) and T2 (after completion of post-surgical orthodontics). They were digitized by a single examiner using the CASSOS computer software. Method error analysis using Bland-Altman plots showed 90% accuracy between duplicate determinants. Soft tissue analysis using a modified Legan and Burstone analysis at T1 and T2 were compared. Linear regression analysis was used to obtain soft to hard tissue ratios and to formulate regression equations for movements of each corresponding pair of soft and hard tissue points.
Results: There were significant reductions in facial convexity angle, upper lip protrusion, lower lip protrusion, vertical lip-chin ratio, upper incisor exposure and labiomental fold with significant increase in mandibular prominence. The ratio of pronasale to anterior nasal spine, subnasale to A point, labrale superius to incision superius, labrale inferius to incision inferius, labiomental fold to B point and soft tissue to hard tissue pogonion was 0.5, 1.0, 0.8, 0.6 and 1.0 respectively in the horizontal plane and 0.7,0.7, 0.7, 0.8, 0.6 and 0.9 respectively in the vertical plane.
Conclusion: Surgical orthognathic correction of Class II Division 1 patients significantly reduces convex facial profiles. Soft tissue movements can be reliably predicted using ratios and regression equations.

## 63 PTHrP and Cbfa1 expression in condylar cartilage during pubertal growth. GH TANG*, ABM RABIE and U HAGG (Orthodontics, University of Hong Kong,HK)

Recent findings on bone biology showed that parathyroid hormone related protein (PTHrP) and core binding factor a1 (Cbfa1) are key factors regulating the chondrocytes maturation during endochondral bone genesis. To clarify whether they also modulate the mandibular condyle growth during puberty, we examined their temporary expression in condylar cartilage. Mandibular condyles were harvested from 70 female Sprague-Dawley rats at age of 21, 28, 35, 42, 49, 56 and 65 days (10 in each age group). An immunohistochemical study was designed to evaluate the expression of PTHrP and Cbfa1 in condylar cartilage. The positive staining was quantified and correlated to the amount of type II collagen. PTHrP was predominately located in chondro-precursors which was lack of collagen II staining, and chondroblasts with faint collagen II signal. Strong PTHrP staining was also detected in erosive layer. High level of Cbfa1 expression in hypertrophic chondrocytes on day 28 and 56 was corresponding to the onset of endochondral ossification indicated by the invasion of marrow elements. Minimum Cbfa1 signal was detected in the chondrocytes layer on day 42 when the PTHrP signal was relatively stronger with increased collagen II synthesis. These findings suggested that PTHrP and Cbfa1 also regulate the process of chondrocytes proliferation and maturation and control the pace of endochondral bone formation in mandibular condyle during pubertal growth. This study was supported by CRCG grant 10203770.22311.08003.323.01 from the HKU.

## 64 Critical Bending Moment of Implant Fixture-Abutment Screw Joint Interfaces: Effect of Torque Levels and Implant Diameter. B.F. TAN* , K.B.C. TAN, J.I. NICHOLLS (National University of Singapore, Singapore and University of Washington, Seattle, USA)

Clinical overload leading to excessive bending moment has been reported as a major cause of implant prosthetic component failure. This study defines Critical Bending Moment (CBM) - the bending moment at which applied non-axial load overcomes the screw joint preload and causes loss of contact between the mating surfaces of implant screw joint components. At this point, all external load will instantaneously be taken up by the screw shank and rapidly lead to screw failure. This study measured the CBM at the fixture-abutment screw joint for 2 fixture diameters (Nobel Biocare (NB) 3.75mm Regular (RP); 5.0mm Wide (WP)) and 2 abutment systems (CeraOne (CO); Multiunit (MU)) to give 4 fixture-abutment test groups. CBM was further measured at 25%, 50%, 75% and 100% of manufacturer recommended torque levels. NB 3.75mm x 15mmL RP and 5.0mm x 15mmL WP fixtures were used. Abutments were strain gauged and microstrain ( ) dynamically logged as known vertical loads (L) were applied on the abutment body at distance x mm from the fixture-abutment interface. Strain instrumentation utilized a Series B HP 75000 VXI multimeter and HP E1357 FET multiplexers. A HP VEE Pro 6.0 program data-logged strain dynamically to determine point of gap-opening. All torque applications and strain measurements with loading to CBM were repeated 5 times and sample size of each fixture-abutment group was 5. Results were: Critical Bending Moment (CBM), Ncm (sd)

| Test Groups / Torque Level | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| CO RP | 17.09 (2.11) | 35.35 (3.75) | 45.63 (5.82) | 62.64 (6.44) |
| CO WP | 28.29 (2.01) | 62.97 (4.62) | 92.20 (7.27) | 127.41 (8.35) |
| MU RP | 16.08 (1.11) | 21.55 (2.06) | 34.12 (2.21) | 39.46 (1.81) |
| MU WP | 15.90 (1.38) | 32.86 (2.42) | 43.29 (3.46) | 61.55 (1.73) |

Two-way ANOVA ($p<0.001$) revealed significant effects for variables test groups ($F=2738.2$) and torque levels ($F=2969.0$). Subsequent multiple one-way ANOVA and Tukey HSD post-hoc tests confirmed that significant differences existed between test groups and torque levels. CBM was found to differ by abutment system, fixture diameter and torque level. CBM in all abutment systems was correlated to applied torque levels. It is recommended that manufacturer recommended torque levels be followed to ensure screw joint integrity.

## 65 The Identification of RANKL in Bone-Resorbing Lesions of the Jaws. [1]J.Y.Y. TAY*, [2]J.F. YEO, [3]M. HARRIS, [4]B.H. BAY ([1]Dept of OMS, National Dental Centre; [2]Dept of OMS, National University of Singapore; [3]Dept of OMS, St Bartholomews and The Royal London School of Medicine and Dentistry, UK; [4]Dept of Anatomy, National University of Singapore, Singapore)

The RANKL/OPG system is the dominant mediator of osteoclastogenesis and its discovery in 1998 shed a long awaited understanding in bone mineralization biology, namely the precise mechanisms by which preosteoblastic/ stromal cells control osteoclast development. It is now known that RANKL promotes osteoclast differentiation, stimulates osteoclast activity, prolongs osteoclast survival and its adherence to bone surface. Abnormalities of the RANKL/OPG system have been implicated in a range of diseases including osteoporosis, rheumatoid arthritis, Paget's disease and periodontal disease. To date, no work has been done in osteolytic lesions of the facial skeleton. The objective of this study was to elucidate if osteolytic processes in bone-resorbing lesions of the facial skeleton are mediated *via* the RANKL pathway. Specimens of ameloblastomas, dentigerous cysts, odontogenic keratocysts, radicular cysts and giant cell granulomas were subjected to immunohistochemical staining to RANKL and tartrate-resistant acid phosphatase (TRAP). The non-osteolytic fibroepithelial polyp was used as a control. Single immunofluroscence and a confocal laser scanner was used to visualise the stained cells. All specimens of ameloblastomas, dentigerous cysts, odontogenic keratocysts, radicular cysts and giant cell granulomas demonstrated distinct stained cells to RANKL and TRAP. Single nucleated cells were localised to the region just below the epithelium with fusion of these cells to form multinucleated cells towards the connective tissue stroma of the lesion. RANKL mediates bone-resorbing processes in osteolytic lesions of the facial skeleton.

## 66 Chemical Composition of the Enamel after Exposure to Bleaching Agent. U.T.K. HA*, L.C. RICHARDS and H.C. NGO (Faculty of Odonto-Stomatology, Ho Chi Minh city University of Health Sciences, Vietnam; Dental School, Adelaide University, Australia)

The objective of this study was to investigate the changes in chemical composition of the enamel after exposure to carbamide peroxide for periods corresponding to advocated vital bleaching protocols. In this study ten extracted, clinically normal, human third molar teeth were collected, the roots removed and the crowns sectioned mesio-distally. The resultant twenty tooth halves were divided randomly into four groups (1, 2, 3 and 4). Each tooth half was subsequently sectioned bucco-lingually and the resultant paired specimens were randomly assigned to experimental or control groups. The control specimens were stored in artificial saliva. The experimental specimens were subjected to bleaching with 10% carbamide peroxide for either 1 hour per day with Opalescence® (Group 1), 2 hours per day (Group 2) or 3 hours per day (Group 3) or with Platinum™ (Group 4), on seven consecutive days. Electron probe microanalysis (EPMA) was conducted to obtain information about calcium, oxygen and phosphorous contents of the bleached and unbleached specimens to a depth of 150 m. Analysis of Variance revealed significant differences in the relative amount of each component between the control and experimental groups in relation to the exposure time ($p<0.05$). Calcium and oxygen weight percentage varied with depth in specimens treated with Opalescence® but not in specimens treated with Platinum™. Hence, it is concluded that bleaching with 10% carbamide peroxide can result in elemental alterations which are associated with depths and times of exposure, with some differences between Opalescence® and Platinum™.

## 67 Influence of Flowable Composite Lining Thickness on Marginal Quality. S.F. CHUANG*, Y.T. JIN.(University Cheng Kung University Hospital, Tainan, Taiwan)

The aim of this study is to investigate the effect of flowable composite lining thickness on marginal morphology and interfacial microleakage of Class II composite restorations. 32 intact molars, each prepared with two box-only Class II cavities, were separately lined with various thickness of flowable composite (FiltekFlow, 3M Dental) and filled with posterior composite (P60, 3M). They were randomly divided into four groups (n=16) as: Group 1, no lining; Group 2, thin lining/light-cured with P60; Group 3, thin lining/ pre-cured; and Group 4, thick lining/pre-cured. These teeth were thermotested for 1500 cycles (5-60 oC), and immersed in dye for 24 h. Replicas of these fillings were fabricated before and after thermocycles, following by SEM examination. Cervical marginal morphology was classified in 5 patterns as excellent, deficient, opening, swelling and overhanging margins. Length of each pattern was measured as the ratio to the whole cervical wall. These teeth were subsequently mid-sectioned and interfacial microleakage was recorded as the extent of dye penetration with a 0-4 scoring system. One-way ANOVA test and the Mann-Whitney test were separately used to analyze the marginal morphology and microleakage. Results from SEM examination revealed that Group 4 presented the highest opening margin percentage both before and after the thermocycles. No significant difference in the overhanging margin was found among these groups. Group 2 showed the least interfacial microleakage and significantly differed from the other groups ($p < 0.05$). These results showed that a minimally thin flowable composite lining improved the cavity adaptation and marginal sealing without increasing marginal overhanging. While a thick lining may impair the marginal seal.