2079 **Profile changes following mandibular advancement surgery using Fourier descriptors.** J. MCFALL *, SD KEELING, PE LESTREL, CA WOLFE, JD RUGH (Univ. of Texas San Antonio, Univ. of Florida, UCLA).

Conventional cephalometric soft tissue (CST) measures give a limited description of the complexity of the facial profile. This study examined the relation among CST measures, measures derived from Elliptical Fourier Functions (EFF), and orthodontists' assessment of profile acceptability (ORTHO) and determined the power of EFF and CST variables to detect ST differences following surgery. Data were obtained from pre- and one year post-treatment radiographs of 30 subjects enrolled in a clinical trial examining rigid vs wire fixation after mandibular advancement surgery. Independent cephalometric tracings were performed for EFF and CST. The EFF analysis involved fitting 84 ST points using 40 harmonics, the SCT 11 ST points. A summary EFF angular variable (EFF-A) was computed from the major axis of the 1st ellipse to the Frankfort plane. Three orthodontists ranked 21 of the 60 profile tracings from least to most acceptable. Correlations between ORTHO (mean score) and EFF / CST variables were examined. The difference between the pre- and post- treatment measures was determined. ORTHO was associated with EFF-A ($r=0.62$, $p<0.01$) and CST variables 'nasion-subnasale-pogonion' ($r=0.61$, $p<0.01$), 'nasal tip to glabella-pogonion' ($r=0.59$, $p<0.01$) and 'nasion-pogonion to Frankfort plane' ($r=0.48$, $p<0.05$). The EFF 'x axis' was associated with the above CST variables (r's=0.53, 0.60, 0.82, respectively; $p<0.001$). Differences existed between pre- and post- treatment EFF-A and the three CST measures above; at alpha = 0.05, all measures displayed power to detect differences > 0.92. Orthodontists' ratings of profile acceptability were weakly related to measures derived from Fourier functions and to conventional descriptors; both Fourier and conventional descriptors had similar power to detect soft tissue differences after mandibular advancement surgery. Supported by NIDR DE07160, DE09630, DE08715.

2080 **Signs of TM disorders following Class II early treatment: Early results.** SD KEELING *, RE BATES, SP MCGORRAY, CW GARVAN, JA ZAMBRANO, HA GREMILLION, TT WHEELER, GJ KING (University of Florida, Gainesville).

Signs of TM disorders (TMJ sounds, muscle/joint tenderness, range of motion) were determined in grade school children enrolled in a randomized clinical trial (RCT) examining early treatment for Class II malocclusion. Inter-examiner (n=5) reliability of signs was evaluated in 25 children using Kappa (K) statistics. Reliability of TMJ sounds, joint tenderness, and muscle tenderness by location was poor (median K's 0.22, 0.08, 0.04), but acceptable when scored as present/absent in a subject (median K's 0.60, 0.53, 0.58). Groups (control, bionator, headgear) did not differ in any TM disorder sign at initial data collection (DC1). Because the RCT continues, descriptive (not inferential) statistics depicted changes in signs of TM disorders in an early cohort of controls (n=37) and a treated group (n=43) who had completed DC3 (molar correction achieved or 2 years of follow-up).

Change DC3-DC1	Control	Treated	Change DC3-DC1	Control	Treated
Time interval (days)	519.24 (225.77)	505.30(230.05)	Left lateral (mm)	0.03 (1.03)	-0.28 (1.39)
Max. opening (mm)	0.22 (2.14)	1.76 (3.70)	Centric slide (mm)	0.17 (0.84)	0.05 (0.47)
Protrusive (mm)	0.56 (0.96)	0.38 (1.88)	Lateral dev (mm)	0.08 (0.91)	0.00 (0.00)
Right lateral (mm)	0.00 (0.99)	-0.64 (1.81)			

Percents of control /treated subjects with an absence at DC3 of a trait which was present at DC1, no change in presence/absence, and presence at DC3 of a trait which was absent at DC1 for (1) TMJ sounds were 3/5, 84/77, and 13/18, respectively; (2) joint tenderness 22/37, 54/56, and 24/7; and (3) muscle tenderness 8/16, 68/70, and 24/14. TM disorder signs with acceptable reliability have been determined. Randomization ensured group equivalency in pre treatment signs of TM disorders. Early results suggest early Class II treatment reduces joint and muscle tenderness. Supported by NIH DE08715.

2081 **REVERSE HEADGEAR TREATMENT IN MIXED DENTITION FOR GIRLS WITH UCLP** L. SO* (Department of Child. Dent. & Orthod., the University of Hong Kong, HONG KONG).

AIM: To study the skeletal and dental changes in the vertical direction due to treatment with reverse headgear in Southern Chinese girls born with complete unilateral cleft lip and palate (UCLP).

MATERIALS AND METHODS: The sample groups consisted of 10 pairs of Southern Chinese girls born with UCLP matched in age (ranging from 9 to 12) and timing of the primary repairs (lip at 3 months & palate at 18 months). The test group was treated with the reverse headgear for a mean period of 9.7 months (s.d. = 1.6). The growth pattern of the control group was observed for the same period of time. Lateral cephalometric radiographs taken before and after the treatment/observation period were analyzed using the method described by Pancherz 1982 (Am.J.Orthod. 82:104-113). Each radiograph was digitized twice and the average value was used. Two tailed t-test was used to assess the statistical significance of the skeletal and dental changes in the vertical plane between the two groups.

RESULTS: The vertical changes were summarized as follows:

Variables (mm or degree)	Test Group (n=10) Mean	S.D.	Control Group (n=10) Mean	S.D.	Group Difference "treatment effects" Mean	p value
Nasal plane angle (NL/NSL)	-1.20	3.07	1.85	4.54	-3.05	n.s.
Mand. plane angle (ML/NSL)	1.50	1.67	-0.30	1.25	1.80	<0.02
Jaw relationship (ML/NL)	2.75	1.81	-2.50	4.61	5.25	<0.01
Lower facial height (sp-gn)	2.69	2.24	0.89	2.02	1.80	n.s.
Overbite (Ii/OLs)	-0.76	2.96	1.29	1.74	-2.05	n.s.
Max. incisor (Ii/NL)	0.31	1.79	1.17	1.35	-0.86	n.s.
Mand.incisor (Ii/ML)	1.45	0.73	1.59	2.53	-0.14	n.s.
Max. molar (mes/NL)	0.43	1.90	0.58	1.99	-0.15	n.s.
Mand.molar (mic/ML)	1.02	1.55	0.52	1.52	0.50	n.s.
Max. occl. plane (OLs/NSL)	-0.60	3.45	0.80	3.38	-1.40	n.s.
Mand.occl. plane (OLi/NSL)	0.55	3.29	0.70	1.95	-0.15	n.s.

- indicates decrease
n.s. = not statistical significant at $p<0.05$

CONCLUSIONS: Reverse headgear treatment for girls born with complete unilateral cleft lip and palate during the mixed dentition stage produced significantly increased angulation of the mandibular plane to both the Nasion-sella line and the maxillary plane leading to increased vertical jaw relationship. No significant difference was found for vertical dental changes.

2082 In vitro evaluation of piezo-electric debonding of metal orthodontic brackets. G.A. CARTER, J.S. MCGILL*, R.L. CHRISTIANSEN, and D.H. KOHN (University of Michigan School of Dentistry, Ann Arbor, MI, USA)

This study evaluated the effectiveness of piezo-electric debonding of metal orthodontic brackets. Orthodontic brackets were bonded to forty extracted human premolars and incisors according to manufacturer instructions. Twenty were bonded with a self cure composite and twenty with a light cure composite. All brackets were debonded by the same operator using one of four metal scaler tips (#31, 32, 34, and 39) and an Amdent 830 piezo-electric ultrasonic unit. The amount of residual adhesive that remained on the tooth surface following debonding was categorized using the Adhesive Remnant Index (ARI) of Artrun and Bergland. Tip wear was analyzed by comparison with a new tip under the SEM. Resin models fabricated from polyvinyl siloxane impressions of surface enamel were prepared and evaluated using the SEM to assess enamel damage. Average debond times were as follows: Tip 31-60.9 sec., Tip 32-41.3 sec., Tip 34-90.8 sec., Tip 39-37.0 sec. There was no significant difference in adhesive used (light cure DB=52.8 sec. versus self cure DB=60.8 sec.). 38/40 trials resulted in an ARI of "1" (> 90% of composite remaining on tooth). Three scaler tips displayed significant vertical wear after debonding 12 teeth (sample size of 10 plus 2 pilot runs). Tip 31-1.7mm, Tip 32-0.7mm, Tip 34-N/A (horizontal wear noted only), Tip 39-1.8mm. Tip 32 resulted in the most enamel damage. We conclude that using piezo-electric energy to debond metal orthodontic brackets is ineffective.

2083 **A Serial Tomographic Study of Limited Lip Bumper Therapy.** M DAVIDOVITCH*, DM MCINNIS, WT LEA, SJ LINDAUER (Virginia Commonwealth University, Medical College of Virginia, Dept of Orthodontics, Richmond VA, USA).

Currently, all clinical information gathered on the effects of lip bumper (LB) therapy have been derived from cephalometric radiographs and/or study models. The conclusions arrived at using these diagnostic tools exclusively have been widely variable. This prospective clinical study was undertaken in order to quantify specific tooth movements related to six months of continuous LB therapy. Eight mixed dentition patients with second mandibular primary molars present and 3-8mm of mandibular crowding were randomly placed in either the treatment or observation/non-treatment group. Those in the treatment group underwent six months of continuous LB therapy. Changes in mandibular left first permanent molar (#30), mandibular central incisor angulation (IMPA), arch perimeter (AP), and arch length (AL) were evaluated. This was done by three different observers using -20° lateral tomographic radiographs bisecting #30 in the sagittal plane, lateral cephalometric radiographs, and study models taken at an initial time point (prior to LB insertion), and six months later. Tomographic analysis revealed the following for treated and untreated subjects respectively: changes in #30 were $3.5\pm2.8°$ *distally* vs $2.5\pm1.0°$ *mesially* ($p=.044$), 1.75 ± 0.5mm *distally* vs $.125\pm.5$mm *mesially* ($p=.002$). Similarly, model analysis showed $+4.5\pm3.1$mm vs -0.8 ± 1.6mm ($p=.03$) for AP, and $+2.9\pm1.9$mm vs -1.3 ± 1.0mm ($p=.009$) for AL. Cephalometric analysis of IMPA showed increased proclination in treated subjects ($4.25\pm1.8°$ vs $1.0\pm1.4°$, $p=.03$). Therefore, it appears that LB therapy significantly alters molar position, AP, AL, and IMPA. In addition, observed increases with treatment in AP and AL due to LB therapy were due 50-65% to incisal proclination and 35-50% to molar distalization/distal tipping.

2084 **Changes in Soft Tissue Profile Following Extraction and Nonextraction Therapy. D.A. GONZALES, R.F. CEEN*, R. ALEXANDER, P.H. BUSCHANG (Baylor College of Dentistry, Dallas Tx, USA).**

This study compares the effects of orthodontic therapy on the profile in "borderline" extraction and nonextraction patients. The sample includes 58 extraction and 58 nonextraction (50 males and 66 females) subjects. The patients were selected based on crowding, age, arch form, and inclination of the teeth. The nonextraction group was case matched to the extraction group based on age, sex, class of malocclusion, crowding, overjet, and overbite. Five profile measures were evaluated: total facial convexity, facial convexity, Holdaway soft tissue angle, upper lip to E-line, lower lip to E-line and nasolabial angle. The results showed treatment differences ($p<0.01$) for 4 of the 6 profile measures. These were due to differences in the movement of the lips and B point, which could in turn be related to tooth movements. The lips of the extraction group remained stable while the non extraction group moved forward. Despite the group differences in treatment change, only the lower lip to E-line showed statistically significant differences between groups posttreatment. We conclude that the treatment differences between extraction and nonextraction therapy are small and insignificant compared to the between subject variability found posttreatment.

2085 Changes in Cephalometric "A" Point with Maxillary Protraction. S. SHANKER*, M. BECK, C. YIU, U. HAGG, S.H.Y. WEI, P. NGAN (The Ohio State Univ. College of Dentistry and the University of Hong Kong).

Previous studies have shown that changes in cephalometric landmark, point "A" can result from maxillary skeletal movement or localized remodelling. The purpose of this study was to determine the relative contribution of skeletal movement and localized remodelling to "A" point changes resulting from treatment with maxillary protraction headgear (PH). Subjects consisted of twenty Chinese patients (mean age=7.5 years) who presented with Class III skeletal malocclusions. Lateral cephalograms were taken 6 months prior to treatment (T_0), at the initiation of PH treatment (T_1), after 6 months of treatment (T_2), and 1 year after termination of treatment (T_3). In this way, (T_1-T_0) represented 6 months of growth without treatment and each patient could then serve as his/her own control. Horizontal and vertical changes of "A" point were measured using Frankfort's horizontal (FH) and FH perpendicular through sella as the reference grid. "A" point changes due to local remodelling was determined by maxillary superimposition using the Bjork and Skieller's structural method (Tran Eur Orthod Soc 1977;7:209-233). Data were analyzed using a one-way, repeated-measures ANOVA and Tukey test. Results showed significantly greater forward movement of "A" point with PH, when compared with growth alone before and after treatment (2.58 ± 1.24 vs -0.20 ± 0.55 and 0.28 ± 0.66mm, $p<.05$), respectively. Significant local remodelling changes were also observed with PH treatment (0.73 ± 0.68 vs -0.38 ± 0.60 and -0.30 ± 0.72mm, $p<.05$), respectively. These results demonstrate that, with maxillary orthopedic traction, 72% of "A" point changes can be attributed to maxillary skeletal movement and 28% to local remodelling.

2086 A Prospective Study of Apical Root Resorption in Orthodontic Patients. BW BECK*, RG KEIM, and EF HARRIS (Department of Orthodontics, University of Tennessee, Memphis).

Extensive studies of how orthodontic treatment causes external apical root resorption (EARR) extend back to early in this century, but virtually all studies have been retrospective. Intent of this ongoing project is to prospectively monitor presence and severity of EARR from initial diagnostic records throughout comprehensive treatment. Standardized periapical X-rays are taken of the four maxillary incisors at four-month intervals. These are the teeth where EARR is most common and most severe. In passing, this study also has generated considerable data on normal (pre-TX) crown and root dimensions. Incisors in males have significantly larger overall lengths, crown widths and heights, and root lengths than females. In contrast, enamel thickness on the mesial and distal borders showed no sexual size dimorphism. To date, 60 patients have been followed for at least six months into treatment. Several prior studies by our group indicate that upper incisor roots lose about 2+ mm during the course of ca. 2 yrs of treatment. Interim results here show that loss of root length is not linear with time; instead, EARR is slower early in treatment since observed rates during the first year extrapolate to appreciably less than 2 mm of resorption. On the other hand, about half the subject exhibit periapical erosion by six months into treatment, so the initial leveling and aligning are not without consequences. Expectation is that rates of root loss will increase when anterior segments are retracted, as with bulbous loops and Class II elastics.