

**FEATURES
SECTION**

British Orthodontic Society, UTG session abstracts

Abstracts of Research Projects

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1st Prize winner

Adaptation of skeletal muscle connective tissue in response to stretch.

A. Auluck*, N. P. Hunt and M. P. Lewis (EDI, UCL).

Objective: The aim of the study was to investigate the response of human craniofacial myotubes to stretch conditions that mimic clinical scenarios, using the expression of MMP-2 as a marker of remodeling of the extracellular matrix (ECM) component of muscle.

Design: A laboratory based study, using an *in vitro* model system at the Eastman Dental Institute (2001–2003).

Materials and method: Three-dimensional cultures of cells derived from explants of human masseter muscle were subjected to mechanical stretch using the Bio-Stretch system. The response of myotubes to different stretch regimes (continuous, cyclical) and amplitudes (40%, 80%) was assessed by investigating the activity of MMP-2 by zymography on the cell-conditioned media. Cell extracts were used to measure creatine phosphokinase (CPK) activity to confirm the presence of myotubes in the stretched cultures.

Results: Scanning electron microscopy of the collagen sponges and the CPK assays confirmed the presence of myotubes. MMP-2 was expressed by all the samples and controls, but was found to be significantly higher in those cultures stretched continuously, compared with cyclical stretch, and in those stretched at amplitude of 80% compared with 40%.

Conclusions: MMP-2 expression, and hence ECM remodeling, is up-regulated in response to stretch and is dependant upon the amount and type of stretch to which the muscle is subjected.

Comparison of bond failure between direct and indirect bonding techniques

S. Thiyagarajah (Birmingham Dental School).

Objective: To compare bond failure rates between direct and indirect techniques for bonding orthodontic brackets.

Design and setting: A single blinded prospective randomized controlled clinical trial carried out at Birmingham Dental Hospital and Good Hope Hospital, Sutton Coldfield.

Materials and methods: Ethical approval was obtained from Birmingham Research Ethics Committee. Thirty-three patients meeting the inclusion criteria were selected from orthodontic treatment waiting lists. A split-mouth study design was used. Over a 1 year period the number and site of bracket failures was recorded.

Results: Of the 553 teeth bonded, 14 brackets failed, giving an overall bond failure rate of 2.5%. Eight bracket failures occurred in the indirectly bonded group and there were six failures with the direct technique. Statistical analysis was carried out using chi-square tests. No statistically significant differences in bond failure rates were found between the two bonding techniques.

Conclusion: In this study, bond failure rates in direct and indirect bonding techniques are comparable.

2nd Prize winner

Thermoplastic appliance for the management of snoring: randomised controlled study

M. E. Cooke* and J. M. Battagel (Royal London Dental Institute, UK).

Objective: To assess the effectiveness of a thermoplastic mandibular advancement device (MAD), TheraSnore, in the management of non-apnoeic snoring.

Design: Randomised controlled study.

Setting: Royal London Dental Institute during 2002–2003.

Materials and methods: Twenty-three adult non-apnoeic snorers wore the appliance in both advanced (active) and non-advanced (sham) positions for 4–6 weeks. Start position was randomized. Outcomes were assessed using questionnaires, and overnight sleep studies at baseline and after each phase. Supine radiographs assessed the airway.

Results: Compared with the sham mode the active MAD reduced median snores per hour from 157 to 18 ($P=0.003$), improved daytime sleepiness ($P=0.036$) and sleep quality ($P=0.041$), whilst sleeping partners reported improvement in their sleepiness ($P=0.002$) and sleep disturbance ($P=0.001$). Radiographs revealed significant vertical opening associated with the appliance. The commonest side effect was dry mouth.

Conclusions: (1) The advanced TheraSnore is effective in the treatment of snoring in 2 out of 3 non-apnoeic snorers. (2) Sleep partners derive benefits from treatment of non-apnoeic snorers. (3) Complaints of dry mouth may be related to the TheraSnore's inherent vertical opening.

Mandibular dental arch changes during orthodontic treatment

P. J. Rice* (Birmingham Dental Hospital and School, UK).

Objective: To identify cephalometric, occlusal, and/or clinical variables predictive of an increased risk of in-treatment mandibular dental arch dimension change.

Design and setting: Retrospective study of the records of 47 Class II division 1 malocclusion cases treated at the Birmingham Dental Hospital with the pre-adjusted edgewise appliance.

Materials and methods: Arch dimensions were recorded from pre- and post-treatment study models using a new on-screen study model analysis program. Cephalometric and clinical parameters were also recorded.

Data analysis: Stepwise multivariate regression analysis was used to identify predictive variables.

Results: Inter canine width increased regardless of whether teeth were extracted or not. Cases with narrow, deep arches and marked incisor irregularity where lower first premolars had been extracted were particularly prone to inter canine expansion. Inter premolar and inter molar width change and the labiolingual change in lower incisor position was largely influenced by the extraction pattern. The particular growth pattern

during treatment may also influence the change in labiolingual lower incisor position.

Conclusions: Particular attention to archwire customization is needed when treating Class II division 1 malocclusions with narrow, deep arches and marked incisor irregularity in association with extractions.

Perceptions of facial aesthetics in 2-D and 3-D

S. A. Todd*, S. Cunningham (Eastman Dental Institute, UCL) and S. Cochrane (EDI, UCL).

Objective: To investigate whether the preferred facial relationship chosen by professionals and the general public is Class I, and to ascertain whether viewing 2-D or 3-D images has any effect on the ranking of facial attractiveness.

Design and setting: This was an investigative, scan-based study undertaken at the Eastman Dental Institute, 2001–2003.

Subjects and methods: Orthodontists ($n=47$), maxillofacial surgeons ($n=25$) and members of the general public ($n=78$) assessed 2-D and 3-D facial scans of two males and two females. The scans had been morphed to produce five images reflecting different skeletal bases: moderate Class II, mild Class II, Class I, mild Class III and moderate Class III. Assessors placed the images in rank order of preference.

Results: Logistic regression analysis showed that neither the general public nor professionals (orthodontists and maxillofacial surgeons) were consistent in their choice of preferred facial relationship, in either 2-D or 3-D formats. Age, but not gender, was significant when assessing the preferred facial relationship.

Conclusions: There was no uniform agreement as to the preferred facial relationship between the three groups of assessors. There was too great a degree of variation to say that a difference between 2-D and 3-D facial images was evident.

3rd Prize winner (Joint)

Perceived need for orthognathic treatment

K. J. Juggins*^{1,2}, F. Nixon¹ and S. J. Cunningham² (¹John Radcliffe Hospital, Oxford, and ²Eastman Dental Institute, London, UK).

Objective: This study examined patient perceived need for orthognathic treatment, as compared with clinician perceived need for treatment.

Design and setting: This was a questionnaire-based study undertaken at the John Radcliffe Hospital, Oxford.

Subjects and methods: Forty pre-treatment patients were recruited from combined orthodontic-surgical clinics and rated their perceived need for treatment, based on facial appearance, dental appearance, function and overall need. Twenty orthodontists and 20 maxillofacial surgeons rated perceived need for treatment based on identical parameters, using study models and clinical photographs. All ratings were marked on 10 cm visual analogue scales, anchored at each end.

Results: Clinicians, as a group, perceived a greater need for treatment based on facial appearance than patients (orthodontists compared with patients $P=0.023$, surgeons compared with patients $p=0.001$). Surgeons rated treatment need based on facial appearance ($P=0.005$) and function ($P<0.001$) significantly higher than orthodontists. Extensive variation was present within the individual clinician groups, for all variables.

Conclusions: Both groups of clinicians rated a greater need for orthognathic treatment based on facial appearance than patients. Surgeons rated treatment need based on facial appearance and function significantly higher than orthodontists. The large variation present within the clinician groups is of concern and warrants further investigation.

Orthodontic-induced changes in dental tissues

N. C. Patel*, H. D. Rodd, P. E. Benson, A. R. Loescher and F. M. Boissonade (School of Clinical Dentistry, University of Sheffield, UK).

Objective: The aim of the present study was to determine whether orthodontic treatment induces any short or long-term changes in the pressure and electrical sensitivity of teeth.

Design: Cross-sectional prospective clinical study.

Methods: Undertaken to compare clinical measures of neural sensitivity of the maxillary branch of the human trigeminal nerve before, during and 6 months following orthodontic tooth movement using quantitative sensory testing. Repeatability studies were undertaken for each modality tested. Pressure detection thresholds were found to be the most reproducible.

Results: Overall, there was a trend for a marked decrease in pressure and electrical thresholds 24 hours after archwire placement with a return towards pre-treatment thresholds 6 months after active therapy. Statistical analysis failed to reveal any significant changes in sensory thresholds as a result of orthodontic treatment. No differences in sensory thresholds were found according to age or gender.

Conclusion: This preliminary study seems to show that orthodontic tooth movement in human subjects does not cause any significant short or long-term changes in the sensory thresholds of associated supporting dento-alveolar tissues.

Drug interventions for pain relief during orthodontic treatment

J. E. Cooper^{1*}, J. E. Harrison¹ and L. Hooper² (¹Liverpool and ²Manchester Universities, UK).

The protocol for James Cooper's systematic review is published in the Cochrane Library. The reference for when it was first published is Drug interventions for pain relief during orthodontic treatment (Protocol for a Cochrane Review). Cooper JE, Harrison JE, Worthington HV. In: The Cochrane Library, Issue 2, 2003. Oxford: Update Software.

Objective: To determine the most effective drug intervention for pain relief during orthodontic treatment.

Design: Cochrane Systematic Review.

Data sources: Electronic databases searched included: OHG Trials Register, Cochrane Pain, Palliative and Supportive Care Group Trials Register, Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINAHL.

Study selection: Randomized and quasi-randomized controlled clinical trials relating to pain control during orthodontic treatment.

Data extraction: Information regarding methods, participants, interventions, outcomes, harms and results were independently extracted, in duplicate, by two reviewers. A quality assessment of all included trials was carried out.

Data synthesis: The Cochrane Oral Health Group's statistical guidelines were followed when analysing the data.

Main results: Seven randomized controlled trials were identified which included 240 participants. A meta-analysis was carried out on 2 papers that compared

pre-emptive v. post-treatment ibuprofen for pain control following separator placement.

Conclusions: Pre-emptive ibuprofen gives better pain relief at 6 hours ($P=0.002$; WMD -10.24 95% CI $-16.59, -3.90$), but post-treatment ibuprofen gives better pain relief at 24 hours ($P=0.04$; WMD 3.74 95% CI $0.20, 7.28$) following separator placement.

The impact of hypodontia on affected children in northeast England

D. R. Slater*, R. S. Hobson and J. H. Nunn (School of Dental Sciences, University of Newcastle-upon-Tyne, UK).

Objectives: To assess the impact of hypodontia on child self-perception and to compare this with parental perception and the clinical assessment of the malocclusion.

Design and setting: A prospective questionnaire based study undertaken at Newcastle Dental Hospital from 2002 to 2003.

Subjects and methods: New hypodontia patients and their parent/guardian completed separate components of the Child Oral Health-related Quality of Life Questionnaire. Impressions were taken and allowed Peer Assessment Rating (PAR) and Index of Complexity, Outcome and Need (ICON) scoring of the study models. The number of absent teeth and the amount of spacing were also recorded.

Results: Sixty patients were included in the study with mean age of 11.9 years (range 7–16) and an average of 5 missing teeth (range 1–17). The functional limitations associated with hypodontia were found to be of greatest concern to the patients. No association was found between the PAR, ICON and questionnaire scores. Measurements of overall spacing showed a positive association with the questionnaire scores.

Conclusions: Patients and parents were mainly concerned with the functional limitations associated with hypodontia. In addition, patients were more concerned with overall spacing than spacing in the upper anterior region alone; this may confirm a greater concern for function than aesthetics.

Personality factors and professional stress levels in UK orthodontists

A. J. Stych* (Cardiff Dental Hospital, UWCM).

Objective: To assess personality and stress levels in UK orthodontists, and determine any differences between different working environments.

Design and setting: A cross-sectional survey of UK orthodontists in 2003.

Subjects and methods: Two-hundred-and-fifty orthodontists from Community, Hospital and Specialist Practice were chosen at random from the BOS database. Three self-report questionnaires were distributed to each participant by post. The Professional Life Stress Scale assessed stress levels and allowed each participant to be placed in 1 of 4 categories ranging from low to very serious stress. The Eysenck Personality Questionnaire, used to assess personality, measured extroversion-introversion (E), neuroticism (N) and psychoticism (P). Personal details including age and gender were also collected.

Results: The response rate was 64.4% (161/250). Analysis of personality showed higher *N* scores in practice ($P<0.05$). 73.1% of the whole sample had low stress, 23.5% were moderately stressed and 3.4% seriously stressed. No significant differences were seen between groups ($P>0.05$). High stress scores were associated with higher *N* scores in all groups and also higher *P* scores in practice.

Conclusions: Personality characteristics, but not area of work affect stress levels in orthodontists.

Evaluation of a 4-META containing orthodontic adhesive: an RCT

J. Ledvinka*, G. J. Brown, R. S. Hobson, P. H. Gordon and J. F. McCabe (Newcastle upon Tyne, UK).

Objective: To evaluate the clinical performance of a 4-META containing acrylic-based orthodontic adhesive.

Design: A randomized controlled clinical trial.

Setting: Orthodontic clinic, Newcastle Dental Hospital 2001–2003.

Subjects and methods: One-hundred-and-sixty consecutive patients aged 10–18 years requiring fixed appliance treatment were taken from the waiting list. Patients received Super-Bond C&B (Sun Medical) or a control adhesive (Right-On, TP Orthodontics). Quadrants were randomly allocated using a split mouth design. Enamel was etched for 30 seconds with 37% phosphoric acid for both materials. Ovation stainless steel brackets were used. Bracket survival time was from placement to first failure or censor. Failure rates, mean survival times (product limit method) and residual adhesive (adhesive remnant index) were determined.

Results: The failure rate and mean survival time (limited to 28.93 months) for brackets bonded with Super-Bond C&B was 4.9% and 27.51 months, and for Right-On 6.8% and 27.08 months. No statistically significant difference was found between adhesives for failure rate ($P=0.09$), mean survival time ($P=0.07$) and residual adhesive ($P=0.24$).

Conclusions: This RCT indicates that for bonding orthodontic brackets, Super-Bond C&B compares equally well to Right-On.

Supporting agency: Sun Medical. Grant no. RES 0187/7009

The efficacy of a plasma arc light in orthodontic bonding

J. Russell,* S. Littlewood and L. Mitchell (St Luke's Hospital, Bradford).

Objective: To evaluate the clinical performance of a plasma arc light (Ortho LITE™, 3M Unitek) against a conventional tungsten-quartz halogen curing-light (Visilux 2, 3M Unitek) for direct orthodontic bonding.

Design: A single centre prospective randomised controlled clinical trial.

Setting: The Orthodontic Department at St Luke's Hospital, Bradford.

Subjects and methods: Forty-one consecutive patients requiring fixed appliances from the orthodontic waiting list. A split mouth technique was adopted, with quadrants randomly assigned to either the plasma arc light or the conventional halogen curing-light and bonded directly with APC® pre-adjusted Edgewise brackets (3M Unitek).

Main outcome measures: Bracket failures, time taken to bond-up the appliances, patient sensitivity or discomfort during curing (assess with a visual analogue scale) and time to replace failed brackets were investigated.

Results: No statistically significant differences in bracket failure rates over the first 6 months were found between the two curing lights. The bond-up times were significantly reduced with the plasma arc light. There were no significant differences in survival rates, rebond times or patient sensitivity.

Conclusion: The plasma arc light is a viable clinical alternative to the conventional halogen curing-light with benefits for both the clinician and patient.

Sandblasted bands and resin-modified cements for improved band retention?

S. K. Sadiq* and S. J. Hodges (Eastman Dental Hospital).

Objective: This study investigated the stress required to deband untreated and sandblasted first molar stainless steel bands (3M Unitek) cemented with a chemically-cured glass ionomer cement (Ketac Cem, Espe Dental) and a light-cured resin modified glass ionomer cement (Fuji Ortho LC, GC Int. Corporation). The best band-cement combination was determined.

Design and setting: A laboratory-based study at the Eastman Dental Hospital and Institute 2002–2003.

Materials and methods: Four human mandibular molar teeth were mounted in acrylic blocks to which 40 samples of each band-cement combination were sequentially cemented. The force (N) required to deband the specimens was attained using an Instron Universal testing machine. The surface area of each band was calculated using the Wild M400 stereomicroscope. The stress required to deband (MPa) was then calculated.

Results: The results were subjected to a three-way ANOVA. The mean stress required to deband sandblasted molar bands was greater than that of untreated bands ($P<0.001$). Bands cemented with light-cured, resin-modified glass ionomer cement required a greater mean stress to deband than those cemented with chemically cured glass ionomer ($P<0.001$).

Conclusion: The combination of light cured, resin modified glass ionomer cement and sandblasted band gave the best band retention.

Clinical evaluation of Fuji-Ortho™ glass ionomer cement for orthodontic bonding

H. Uys* and D. O. Morris (Seacroft Hospital, Leeds, UK).

Objective: An *in vivo* investigation to assess the clinical performance and bond failure rates of brackets bonded with a resin-modified glass ionomer cement (Fuji Ortho™). The two different bonding methods recommended by the manufacturer were compared.

Design: A single center, split-mouth, prospective randomized controlled clinical trial following the recommendations of the CONSORT statement.

Setting: Hospital-based orthodontic department, Leeds, UK.

Subjects: Forty-eight consecutive patients (25 females and 23 males) requiring upper and lower fixed appliance therapy with or without extractions.

Materials and methods: A total of 836 teeth were bonded with 'A' Company Andrews prescription brackets. Half the brackets were bonded using an 'etched' (conditioned) technique whilst the other half was bonded using a moist, 'non-etched' procedure.

Outcome measures: The site and time to initial bond failure during the first 6 months of treatment. The Aesthetic Remnant Index (ARI) was used to assess the amount of resin remaining on the enamel surfaces.

Results: The bond failure rate for the 'etched' method was 4.8 and 6.9% for the 'non-etch' technique. The majority (77%) of failures occurred at the enamel-adhesive interface.

Conclusions: Both bonding methods exhibited acceptable bracket failure rates during the initial 6 month study period.

Pretreatment cephalometric measurements for prediction of functional appliance outcome

I. D. Cozma* (Watford General Hospital/ Eastman Dental Hospital).

Objective: The aim of this study was to identify any features on pre-treatment cephalograms, which may predict a favorable skeletal change during functional appliance treatment.

Design and setting: Retrospective cephalometric analysis that compared pre-treatment measurements from patients that responded favorably to functional appliance therapy with measurements of matched Class I subjects. The study was undertaken at Watford General Hospital between 2001 and 2003.

Materials and methods: Three groups were included in the study. The skeletal (22 patients) and non-skeletal (22 patients) group were identified from a sample of 77 patients who completed functional appliance therapy by achieving Class I incisor relationship. The change in ANB angle during treatment was used to identify these groups. The control group consisted of 24 Class I subjects. Various pre-treatment cephalometric measurements were compared using non-parametric tests.

Results: The patients in the skeletal group demonstrated a smaller pre-treatment mandible compared with controls and a larger pre-treatment overjet and ANB angle. The individual variability, however, was too large to recommend consideration of this method for prediction in a clinical setting.

Conclusions: It is unlikely that the outcome to functional appliance treatment can be accurately predicted using cranio-facial measurements from lateral cephalograms.

Acrylic capping and lower incisor position following Twin Block therapy

K. A. Young* and J. E. Harrison (University of Liverpool, UK).

Objective: To evaluate the effects of the addition of lower incisor capping on their position following treatment with the Twin Block appliance.

Design: Retrospective observational cohort study.

Settings: Three hospitals within the Mersey Deanery, UK.

Subjects and methods: Sixty patients, presenting with a Class II division 1 malocclusion, treated with Twin Block appliance therapy, either with or without the addition of acrylic capping to the lower incisor region. Changes in lower incisor position were assessed using pre- and post-treatment lateral cephalograms.

Outcome measures: Degree of lower incisor change relative to the mandibular plane and the A-pogonion line.

Results: No statistically significant difference was found in lower incisor inclination relative to the mandibular plane following treatment ($P=0.81$; mean difference=0.270; 95% CI -1.91, 2.40). However, the advancement of the lower incisors relative to the A-Pogonion Line was statistically significantly greater in those cases with incisor capping ($P=0.01$; mean difference=1.2 mm (95% CI 0.32; 2.00).

Conclusion: This study found that the addition of capping to the lower incisor region of Twin Block appliances did not affect the lower incisor position relative to the mandibular plane but lower incisors that had been capped advanced more relative to the A-pogonion line.