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FEATURES SECTION

Evidence-based orthodontics

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Angle Orthodontist **2002; 72: 135–140**

Powered vs manual tooth brushing in fixed appliance patients: a short term randomised clinical trial.
Hickman J, Millett DT, Sander L, Brown E, Love J

Objectives: To compare the efficacy of a powered toothbrush and a manual one.

Design: Randomized controlled trial.

Setting: Glasgow Dental Hospital and School, Scotland, UK.

Participants: Sixty-three patients undergoing upper and lower arch fixed appliance treatment.

Interventions: Powered—Braun Oral B Plaque Remover 3D with orthodontic head *Manual*—Reach, Johnson and Johnson®.

Outcome measures: Orthodontic modification of the plaque index (PI); gingival index (GI); Eastman interdental bleeding index (IBI) measured at baseline, 4 and 8 weeks.

Results: Three patients withdrew or were withdrawn. Sixty patients completed the trial. For all between visit comparisons there were no statistically significant differences in any of the outcomes between the groups.

Conclusions: This study demonstrated that the powered toothbrush, with a dedicated orthodontic head, was as effective at cleaning around fixed appliances and maintaining gingival health in patients undergoing orthodontic treatment.

Implications: A powered toothbrush appears to offer little advantage over a manual one in a closely monitored short-term clinical trial of patients undergoing orthodontic treatment with fixed appliances. As many parents ask whether it is worth buying a powered toothbrush for their child, whilst undergoing orthodontic treatment, it would seem appropriate to assess whether there is still no difference in efficacy over the whole length of treatment in another trial.

European Journal of Orthodontics **2002; 24: 159–66.**

The effects of continuous intrusive force on human pulpal blood flow
Sano Y, Ikawa M, Sugawara J, Horiucho H, Mitani H

Objective: To examine the effect of continuous intrusive force application on human pulpal blood flow (PBF).

Design: Controlled clinical trial.

Method of allocation: Unclear.

Setting: Tohoku University, Sendai, Japan.

Participants: Thirteen healthy volunteers with healthy $\underline{|1}$.

Interventions: Both groups had an 0.022 × 0.028-inch bracket placed on $\underline{|1}$ and bands on $\underline{6|6}$. An acrylic ring was bonded to the labial surface of $\underline{|1}$, so that its centre was 2 mm from the gingival margin. A modified utility arch (UA) was placed. UA was adjusted to deliver 0.5 N intrusive force to $\underline{|1}$ in the experimental group and to be passive in the control group. Laser Doppler flow meter was used to measure the PBF before and after archwire engagement at days 1–6.

Outcome measures: Primary—PBF $\underline{|1}$. Secondary—pain, discoloration.

Results: The experimental group had a significant greater reduction in PBL from base line during wire engagement than the control group ($p < 0.05$). In the post-engagement period there was no significant difference in the reduction in PBF from baseline. The patients in the experimental group experienced pain on biting, that was worst at 2 days, for up to 5 days after activation.

Conclusions: When an intrusive force is applied to teeth the PBF is reduced and patients experience pain in the affected teeth.

Implications: Toothache, due to the application of force during orthodontic treatment, is likely to be due to a reduction in PBF and is worst at 2 days post-application. Orthodontists can warn their patients of this.

European Journal of Orthodontics **2002; 24: 167–74**

Effects of headgear Herbst and mandibular step-by-step advancement versus conventional Herbst appliance and maximal jumping of the mandible

Du X, Hägg U, Rabie ABM

Objectives: To compare dental and skeletal changes, during treatment of Class II division 1 malocclusions, using a Herbst appliance with or without headgear and different methods of mandibular advancement.

Design: Controlled clinical trial.

Method of allocation: Unclear.

Setting: West China University, Sechuan, China.

Participants: Forty-five Chinese children with Class II division 1 malocclusions.

Interventions: Both groups treated with a Herbst appliance**.** One group treated with headgear and step-by-step advancement (HHSSA) and the other with maximal jumping (HMJ) of the mandible

Outcome measures: Primary—reduction in overjet; correction of molar relationship; skeletal changes.

Results: There was no significant difference in the reduction in overjet obtained for each group. The changes in molar relationship ($p < 0.001$), sagittal jaw relationship ($p < 0.001$), and maxillary position ($p < 0.001$) were significantly greater in the HHSSA group. The contribution that skeletal changes made to the overjet reduction ($p < 0.001$) and correction of molar relationship ($p < 0.001$) were significantly greater in the HHSSA group. The increase in mandibular angle ($p < 0.001$) and vertical position of the maxillary molars ($p < 0.001$) were significantly less in the HHSSA group.

Conclusions: There was no difference between the two interventions in the effectiveness of correcting the overjet. However, the skeletal changes were greater and contributed more to the correction of the malocclusion, and the vertical dimensions were controlled better in the HHSSA group.

Implications: The increased contribution of the skeletal changes, that addition of headgear to the Herbst appliance provides, may be beneficial for patients with a significant Class II skeletal discrepancy and may be useful for patients with an increased mandibular angle and/or tenuous overbite. May benefit from the extra control of the vertical dimension that HHSSA gives.

European Journal of Orthodontics **2002; 24: 191–8.**

A comparative study of two mandibular advancement appliances for the treatment of obstructive sleep apnoea

Rose E, Staats R, Virchow C, Jonas IE

Objectives: To compare the effectiveness of two mandibular advancement appliances (MAA) for the treatment of patients with mild obstructive sleep apnoea (OSA).

Design: Randomized controlled cross-over trial.

Setting: University of Freiburg, Germany.

Participants: Twenty-six patients with polysomnographic diagnosis of mild OSA.

Interventions: Silencor® MAA—a soft polyethylene appliance with bilateral connectors to produce the mandibular advancement; Karwetzky U-clasp activator—a horizontally split functional appliance. Each appliance was worn for 6–8 weeks with a 2–3-week washout period.

Outcome measures: Primary—respiratory parameters including respiratory disturbance index (RDI), apnoea index (AI), baseline, and minimum O_2 saturation. Secondary—subjective assessment of daytime sleepiness, snoring and appliance acceptability.

Results: Three patients withdrew from each group due to pain or repeated breakages. Six patients were unable to adjust to their second appliance so did not complete the study. Sixteen (62%) patients used both appliances and were assessed. The activator was statistically significantly more effective at improving the RDI and AI but not the minimum O_2 saturation. Subjectively, 11 patients preferred the activator and five the Silencor®, but no differences were found between the amount of daytime sleepiness and snoring.

Conclusions: The functional appliance appears to be more effective at reducing the number of apnoeic events and total apnoeic time during sleep.

Implications: As orthodontists we may be approached to provide MAA for patients with OSA as they appear to be effective and are similar to functional appliances that we fit for our younger patients.

European Journal of Orthodontics **2002; 24: 239–49.**

Mandibular advancement splints and continuous positive airway pressure in patients with obstructive sleep apnoea: a randomised cross-over trial

Tan YK, L'Estrange PR, Luo Y-M, Smith C, Grant HR, Simonds AK, Spiro SG, Battagel JM

Objectives: To compare the efficacy of a mandibular advancement splint (MAS) with nasal continuous airway pressure (nCPAP) in patients with obstructive sleep apnoea (OSA).

Design: Randomized controlled cross-over trial.

Setting: University College of London Hospital and the Royal Brompton Hospital, London, UK.

Participants: Twenty-four patients with mild or moderate OSA.

Interventions: A soft, one-piece vacuum formed MAS for the first 10 patients, then a Silencor® MAS; nCPAP. Each was used for 2 months with a 2-week washout period.

Outcome measures: Primary—polysomnographic parameters including apnoea/hyponoea index (AHI), O_2 desaturation, duration of apnoea related desaturations, arousals per hour, sleep efficiency, and REM sleep. Secondary—Epworth sleepiness score (ESS) and subjective assessments of daytime sleepiness and general health by the patient and partner.

Results: Two patients could not tolerate the nCPAP and one the MAS. These patients completed one arm of the study and were included in the data analysis. Both interventions significantly improved the AHI, arousals per hour, ESS, and general health of the patient and partner. nCPAP significantly improved the O_2 desaturation and daytime sleepiness. There were no statistically significant differences between the outcomes using either intervention. Seventeen out of 23 patients, who completed both arms of the trial, preferred the MAS.

Conclusions: The MAS appears to be as effective as nCPAP at improving the outcomes of interest and is preferred by most patients.

Implications: MAS may replace nCPAP as the 'gold standard' for treatment of mild or moderate OSA if larger studies confirm these findings.

European Journal of Orthodontics **2002; 24: 251–62.**

Mandibular advancement appliances and obstructive sleep apnoea: a randomised clinical trial

Johnston CD, Gleadhill IC, Cinnamond MJ, Gabbey J, Burden DJ

Objectives: To assess the effectiveness of a mandibular advancement appliance (MAA) in patients with obstructive sleep apnoea (OSA).

Design: Randomized, placebo controlled, cross-over trial.

Setting: School of Clinical Dentistry and Belfast City Hospital, Northern Ireland, UK.

Participants: Twenty-one patients with OSA ($\leq$10 desaturations/hour).

Interventions: Active—a bilaminate acrylic, dual arch, one piece MAA. Placebo—a dual laminate, upper anterior bite. Each was used for 4–6 weeks.

Outcome measures: Primary—apnoea/hyponoea index (AHI), oxygen desaturation index (ODI). Secondary—Epworth sleepiness score (ESS), reported frequency and loudness of snoring and frequency of waking refreshed.

Results: One patient was unable to tolerate the MAA and withdrew from the study. This patient was not included in the data analysis. Twenty patients completed each arm of the trial. The MAA was significantly better than the placebo at improving the AHI ($p = 0.011$) and ODI ($p = 0.002$)scores. A third of patients had their AHI and 35 per cent their ODI scores reduced to $\geq$10. There were no statistically significant differences in the improvements brought about by the MAA compared with placebo, in the other outcomes of interest.

Conclusions: The MAA appears to be more effective than a placebo appliance at improving the objective measures of OSA. Treatment was successful in about a third of patients.

Implications: Although the objective measures of OSA were significantly improved by the MAA this was not translated into improvements in daytime sleepiness or snoring that are usually what concerns patients. Larger studies may show these differences to be significant.

***European Journal of Orthodontics* 2002; 24: 293–301.**

The relationship between odontogenic bacteraemia and orthodontics treatment procedures

Lucas VS, Omar J, Vieira A, Roberts GJ

Objectives: To estimate the prevalence and intensity of bacteraemia associated with orthodontic treatment procedures.

Design: Randomized controlled trial.

Setting: Eastman Dental Institute for Oral Health Care Sciences, London, UK.

Participants: Eighty-one children undergoing a general anaesthetic (GA) for a dentoalveolar procedure associated with their orthodontic treatment and 61 children receiving orthodontic treatment in the outpatient department (OPD).

Interventions: GA—upper alginate impression or separator placement. OPD—band placement or archwire adjustment.

Outcome measures: Prevalence of bacteraemia (percentage of positive blood cultures); intensity of bacteraemia (number of colony forming units of bacteria per millilitre of blood); identity of the bacteria.

Results: There was no significant difference in the prevalence of bacteraemia between baseline and following any of the four procedures. The intensity of bacteraemia was significantly greater following separator placement ($p < 0.002$) than at baseline, but not following any of the other procedures. The bacteria isolated at baseline and following the procedures were mainly coagulase-negative staphylococci. Other bacteria isolated at baseline included *S. oralis* and *S. mitis*, and following the procedures included *S. gordonii, S. sanguis, S. salivarius*, and *S. vestibularis*.

Conclusions: This study has shown that there was no significant difference in the prevalence of bacteraemia following four common orthodontic procedures. However, the intensity of bacteraemia was significantly greater in some patients following separator placement.

Implications: This study has helped to identify which orthodontic procedures may be a significant cause of dental bacteraemia and would require antibiotic prophylaxis in patients with predisposing cardiac lesions.