

FEATURES SECTION

Evidence-based orthodontics

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European Journal of Orthodontics

An *in vivo* and *ex vivo* study to evaluate the use of glass polyphosphonate cement in orthodontic banding. *Eur J Orthod* 2003; 25: 319–23

Clark JR, Ireland AJ, Sherriff M

Objectives: To compare the bond failure rate and taste of a new glass polyphosphonate cement (Diamond[®], Kemdent[®], Associated Dental Products Limited, UK) and glass polyalkenoate cement (Ketac-Cem[®], ESPE America, PA, USA).

Design: A split mouth, randomized controlled trial.

Setting: UK.

Participants: Thirty-one patients undergoing 2-arch fixed appliance therapy.

Interventions: Diagonally opposite first molar bands were cemented with either Diamond[®] or Ketac-Cem[®]. Patients rinsed their mouths with water following banding with each cement and were asked to comment about the relative taste of them. An initial aligning nickel titanium archwire was placed and the patients were reviewed at 6-weekly intervals. At each visit the bands were checked for cementation failure. Any failure was recorded and the band re-cemented with the same cement. Band failure data were retrieved from the notes at 3 and 6 months into active treatment.

Outcome measures: Band failure rate and taste.

Results: The failure rates of the cements were therefore with 2, out of 62 of the bands cemented with each cement, failing by 3 months and 4 out of 62 by 6 months. There was no statistically significant difference in patients' preference for the taste of the cements ($p=0.02$).

Conclusions: The results of this study indicate that there was no difference in the band failure rate of the new glass polyphosphonate cement (Diamond[®]) and the glass polyalkenoate cement (Ketac-Cem[®]). Patients did not express a preference for the taste of one of the cements over the other.

Implications: This study suggests that the new glass polyphosphonate cement (Diamond[®]) may be used as an

alternative for glass polyalkenoate cement (Ketac-Cem[®]), although no superiority in its performance or acceptability was found. It would be worthwhile to continue this study to assess the comparative bond failure rates over a full course of treatment.

Constant versus dissipating forces in orthodontics: the effect on initial tooth movement and root resorption. *Eur J Orthod* 2003; 25: 335–42

Weiland F

Objective: To compare the tooth movements and root resorption occurring when using stainless steel (SS) and nickel titanium (NiTi) archwires.

Design: A split-mouth, controlled clinical trial.

Setting: Graz, Austria.

Participants: Twenty-seven patients receiving orthodontic treatment.

Interventions: Acrylic splints, covering all but the experimental teeth, were cemented to the teeth. The experimental teeth were bonded with 0.018 inch brackets. Brackets, for the teeth adjacent to the experimental ones, were incorporated into the splint to be 4.5 mm buccal to the experimental brackets. On one side, a 0.016 inch Sentalloy[™]-blue (GAC International Inc., NY, USA) was ligated into the three brackets with wire ligatures. On the contra-lateral side the teeth were ligated to an 0.016 inch SS archwire (Ormco Corporation, CA, USA), which was activated by a 1 mm buccal offset to the experimental tooth. After 4 and 8 weeks, the SS wire was reactivated. At 12 weeks, the appliances were removed, impressions for study models (SMs) taken and the experimental teeth extracted under local anesthetic.

Outcome measures: 3D tooth movements measured from the SMs and the number, depth, perimeter, area and volume of the resorption lacunae measured using a confocal laser scanning microscope (Lasertec Corporation, Japan).

Results: The teeth moved and tipped buccally significantly more under the influence of the NiTi wire ($p<0.001$; $p<0.01$, respectively) during the 12-week experimental period. The number, depth, perimeter, area

and volume of the resorption lacunae were significantly greater/larger ($p < 0.001$) in the teeth moved with the NiTi wire.

Conclusions: Tooth movement was quicker with NiTi wires, but the teeth moved with a NiTi wires suffered more root resorption than those moved with a SS one.

Implications: It appears that we still don't have the ideal arch wire and clinicians need to balance the need for more efficient tooth movement against the potential risk of greater root resorption. However, due to the time limits of this study, it was not possible to see whether there was any recovery of the root surface damage.

American Journal of Orthodontics and Dentofacial Orthopedics

Effectiveness of early orthodontic treatment with the Twin-block appliance: a multi-center, randomized, controlled trial. Part 2: Psychological effects. *Am J Orthod Dentofac Orthop* 2003; 124: 488–95

O'Brien K, Wright J, Conboy F, Chadwick S, Connolly I, Cook P, *et al.*

Objectives: To examine children's perceptions of the benefits and evaluate the psychological effects of orthodontic treatment, to reduce overjets, with the Twin-Block appliance.

Design: A multi-center, randomized controlled trial.

Setting: Hospital based orthodontic departments in the UK.

Participants: 176 patients, aged 8–10 years, with a Class II division 1 malocclusion. Eighty-nine patients were allocated to the Twin-Block group and 87 to the control.

Interventions: Twin-block (TB) appliance with Adams clasps on 64/46; 0.9 mm ball clasps in the inter-proximal areas of the mandibular incisors; a labial bow \pm midline expansion screw. The jaw registration was taken with a 7–8 mm protrusion and the buccal segments apart by about 7 mm.

Control group: treatment delayed for at least 15 months. Questionnaires were completed at baseline and 15 months later.

Outcome measures: The Piers–Harris Children's Self-concept Score, Childhood Experience Score and a 23-item measure to assess perceived orthodontic treatment benefits.

Results: The mean self-concept scores, for both the treatment and control groups, were higher than reported population norms. When controlling for baseline scores,

the treatment group had significantly better self-concept scores at 15 months ($p = 0.01$). The only variable, apart from baseline score, that affected the childhood experience score was treatment with the treatment group having a significantly better score than the control group ($p = 0.03$). The perceived benefits of orthodontic treatment included improvements in 'general well being', 'confidence', 'health of teeth' and 'mouth function', and accounted for nearly 60% of the variance.

Conclusions: Children receiving early treatment, with a Twin-block appliance, for their Class II division 1 malocclusion had higher self-concept, fewer negative experiences and perceived their treatment to have had benefits for their psychological well-being and dental health.

Implications: This study suggests that, from a psychological point of view, children with Class II division 1 malocclusions benefit from early treatment. It would be worthwhile to continue this study to see whether the relative benefits of early treatment are maintained once the control group has received treatment.

Activation time and material stiffness of sequential removable orthodontic appliances. Part 1: ability to complete treatment. *Am J Orthod Dentofac Orthop* 2003; 124: 496–501

Bollen A-M, Huang G, King G, Huijoel P, Ma T

Objectives: To determine whether the frequency of appliance change and/or stiffness of the material influenced the success of treatment with sequential removable orthodontic appliances.

Design: A randomized controlled trial stratified by PAR score and need for extractions.

Setting: Seattle, Washington, USA.

Participants: Fifty-one adult patients, 36 women and 15 men with a mean age of 34 years (range 19–55) who were able to attend week appointments and able to pay for treatment. Patients with a skeletal discrepancy requiring orthognathic surgery were excluded.

Interventions: Invisalign (Align Technology, California, USA) clear, acrylic sequential removable appliances made of either a 'hard' material (twice as stiff as the commercially available material) or a 'soft' material (one-tenth as stiff as the commercially available material) changed either weekly or alternated weeks.

Outcome measures: Completion rate.

Results: Only 15 (30%) of the 51 patients who enrolled in the study completed treatment with the initial regimen of

aligners. This rate did not vary significantly between the groups ($p=0.47$). The only significant impact on the completion rate was the need for extractions ($p<0.02$). Patients who had hard appliances and were on the two weekly regimen had the highest success rate (75%).

Conclusions: Patients with a 2 week activation regimen, no extractions and a low pre-treatment PAR score were more likely to complete treatment with their initial series of aligners. However, the completion rate overall was low.

Implications: This study suggests that, once again, case selection is the key to successful outcome of orthodontic treatment, in this case, with sequential removable orthodontic appliances.

Activation time and material stiffness of sequential removable orthodontic appliances. Part 2. Dental improvements.

Am J Orthod Dentofac Orthop 2003; 124: 502–8

Clements KM, Bollen A-M, Huang G, King G, Huijjoel P, Ma T

Objectives: To determine whether the frequency of appliance change and/or stiffness of the material influenced the quality of improvement in the malocclusion following treatment with sequential removable orthodontic appliances.

Design: A randomized controlled trial stratified by PAR score and need for extractions.

Setting: Seattle, Washington, USA.

Participants: Fifty-one adult patients, 36 women and 15 men with a mean age of 34 years (range 19–55) who were able to attend week appointments and able to pay for treatment. Patients with a skeletal discrepancy requiring orthognathic surgery were excluded.

Interventions: Invisalign (Align Technology, California, USA) clear, acrylic sequential removable appliances made of either a ‘hard’ material (twice as stiff as the commercially available material) or a ‘soft’ material (one-tenth as stiff as the commercially available material) changed either weekly or alternated weeks.

Outcome measures: Change in weighted PAR score and irregularity index, closure of extraction spaces and gingival bleeding.

Results: Only 15 (30%) of the 51 patients who enrolled in the study completed treatment with the initial regimen of aligners. There were no statistically significant differences in the PAR score reduction, irregularity index between the groups. Only 59 of a possible 4000 sites had a bleeding score greater than 1. Although the mean bleeding score did show a statistically significant decrease during treatment it was thought not to be of any clinical significance.

Conclusions: There appears to be very little difference in the outcome of treatment with either a hard or soft appliance changed either weekly or 2-weekly.

Implications: This study suggests that a moderate degree of improvement (mean 31%; 8.5 PAR points) is possible using sequential removable orthodontic appliances. Unlike fixed appliances they appear to have only a small deleterious effect on the gingival health during treatment.