FEATURES SECTION

Evidence-based orthodontics

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European Journal of Orthodontics

A clinical study of glass ionomer cement. *Eur J Orthod* 2004; 26: 185–9
Oliveira SR, Rosenbach G, Brunhard IHVP, Almeida MA

Objectives: To compare the performance of a glass ionomer cement (GIC) with a composite cement for direct bonding of standard edgewise brackets.

Design: A split mouth controlled clinical trial with the allocation alternating between patients.

Setting: Rio de Janeiro, Brazil.

Participants: Fourteen patients (242 teeth), 10 female, age 10–15 years of age who received fixed orthodontic appliance therapy.

Interventions: Metal brackets were bonded to incisors, canines and premolars with either Concise (3M do Brazil Ltd, Sumaré SP, Brazil) or Fuji Ortho LC (GC Corporation, Tokyo, Japan).

Outcome measures: First time bond failure rate over a period of 24 months. The wire *in situ* when the bond failed was noted.

Results: Overall, there was statistically significantly greater ($p=0.042$) bond failure rate in the GIC group (28.1%) than in the Concise group (15.7%). However, there was only a statistically significant difference ($p=0.019$) between the groups when in heavy arch wires (0.020 inch and 0.0192×0.025 inch stainless steel). There were no statistically significant differences in the bond failure rate when in light (0.0175 inch twistflex, 0.014 inch stainless steel) or medium (0.016 and 0.018 inch stainless steel) archwires.

Conclusions: The results of this study indicate that the bond failure rate of GIC is only greater than Concise when in heavy archwire.

Implications: This study suggests that GIC may be a viable alternative to Concise when treatment is limited to the use of light and medium archwire, e.g. in patients with poor oral hygiene who are receiving treatment with limited objectives.

Effects of bilateral upper first premolar extraction on the mandible. *Eur J Orthod* 2004; 26: 223–31
Meral O, İşcan HN, Okay C, Gürsoy Y

Objectives: To evaluate the effects of bilateral upper first premolar extraction on mandibular position.

Design: A randomized controlled trial.

Setting: Gazi, Turkey.

Participants: Twenty-six children at the peak of their pubertal growth spurt with a Class I skeletal pattern, a half cusp Class II molar relationship, significant crowding in the upper arch, a normal or slightly increased overjet and only 0–2 mm crowding in the lower arch.

Interventions: Treatment group: Upper first premolars were extracted at T1, and then the patients were followed-up, without active orthodontic treatment, until the end of their peak growth period (T2). *Control Group:* The patients were followed-up from T_1 to T2 without extractions or active orthodontic treatment. Both groups had fixed appliance therapy after T2.

Outcome measures: Skeletal age and growth potential determined from hand-wrist radiographs taken at T1. Changes in linear and angular cephalometric variable between T1 and T2.

Results: The groups were comparable at baseline with respect to age, skeletal age and growth potential as determined for hand-wrist radiographs. There were no statistically significant differences between the treatment and control groups in any of the cephalometric variable except for SNB, measured on the total superimposition, that increased by a median of 2° in the control group and stayed the same in the treatment group ($p=<0.05$). However, this was not apparent when the angular measurements between groups were compared.

Conclusion: The results of this study suggest that extraction of $\underline{4|4}$ results in an inhibition of anterior mandibular growth.

Implications: It appears that anterior mandibular growth may be inhibited following the loss of first

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premolars however, this result must be viewed with caution due to the small sample size and multiple testing. A larger study, over a longer period, would help to clarify whether this finding is genuine and/or maintained.

American Journal of Orthodontics and Dentofacial Orthopedics

Controlled slicing in the management of congenitally missing second premolars. *Am J Orthod Dentofac Orthop* 2004; 125: 537–743
Valencia R, Saadia M, Grinberg G

Objectives: To compare the mesial drift of permanent molars following either the extraction or controlled slicing of second deciduous molars when second premolars were congenitally missing.

Design: A controlled clinical trial.

Setting: Mexico City, Mexico.

Participants: Thirty-four patients with 52 missing premolars of which 42 (81%) were mandibular. The groups were subdivided according to age, i.e. $\leqslant 9$ and >9 years.

Interventions: Mandibular second deciduous molars. *Group 1*: controlled slicing of the distal surface of 28 teeth followed by hemisection of the distal portion of the root and then extraction of the mesial portion. *Group 2*: extraction of 14 teeth. Maxillary second deciduous molars. *Group 3*: extraction of 10 teeth. Physiological drifting of the permanent molar(s) was then allowed to occur.

Outcome measures:

	Good	Average	Poor
Space closure	$\geqslant$80%	60–80%	$<$60%
Mesial rotation/inclination	Slight	Slight	Major
Centreline shift	None	Slight	Major
Time (months)	$<$12	12–18	$>$18

Results: Overall, 71.4% of the teeth treated with controlled slicing showed good results, with 21.4% average compared with 71.5% of the extraction group showing average/poor results. However, in the younger group controlled slicing resulted in good results in eighteen (90%) teeth and average in 2 (10%) teeth compared with 2 (28.5%) and 3 (42.8%), respectively, for the extraction group. In the older age group similar results were seen in each group. The results were satisfactory for all maxillary molars.

Conclusions: When second premolars were congenitally missing, controlled slicing of the distal surface of the second deciduous molars, followed by hemi-section of the distal portion of the root and then extraction of the mesial portion, produced better results than extraction of the deciduous molar in children $\leqslant 9$ years of age. Above this age the results for each procedure were similar.

Implications: It appears that it would be worthwhile to undertake controlled slicing of the distal surface of the second deciduous molars, followed by hemi-section of the distal portion of the root and then extraction of the mesial portion, in young ($\leqslant 9$ years) children, whose second premolars are definitely missing to enhance natural space closure and minimize the need for orthodontic treatment. However, caution should be exercised if the space resulting from the loss of the second deciduous molars is needed to correct another aspect of the malocclusion or in case of the late development of the premolar. A larger randomized study would be worthwhile to clarify the effects of these interventions.

Outcomes in a 2-phase randomized trial of early Class II treatment. *Am J Orthod Dentofac Orthop* 2004; 125: 657–67
Tulloch JFC, Proffit WR, Phillips C

Objectives: To assess whether growth modification influenced the end of phase 2 skeletal or dental relationships, the time taken for comprehensive treatment or the proportion of children requiring more complex treatment.

Design: A randomized controlled trial.

Setting: North Carolina, USA.

Participants: Children with an overjet of $\geqslant 7$ mm, who were in the mixed dentition and at least a year before their pre pubertal growth.

Interventions Phase 1: Observation only or treatment with either combination headgear or a bionator functional appliance for 15 months. *Phase 2:* Re-randomized, within their original treatment group, to 1 of 4 clinicians who undertook the treatment they deemed necessary.

Outcome measures: Linear and angular cephalometric variables; PAR score; unsatisfactory results (PAR score

>10); extraction rate; orthognathic surgery rate and treatment time.

Results: By the end of phase 2 the differences in linear and angular cephalometric values, seen at the end of phase 1, had disappeared and there were no statistically significant differences in any variable between the phase 1 groups. There were no statistically significant differences in the PAR score ($p=0.35$), length of phase 2 ($p=0.2$), number of children who received orthognathic surgery ($p=0.69$) or who had extractions ($p=0.02$).

Conclusions: There appears to be little, if any, benefit in undertaking early orthodontic treatment to correct Class II malocclusions because, on average, it did not improve the overall outcome of treatment, shorten phase 2 treatment or reduce the number of children who required orthognathic surgery or extractions.

Implications: This study brings into question the rationale of two-phase orthodontic treatment and suggests that it should not be considered as an efficient way to treat most children with a Class II malocclusion.

Angle Orthodontist

Comparison of two different gingivectomy techniques for gingival cleft treatment. *Angle Orthod* 2004; 74: 375–80
Malkoc S, Buyukyilmaz T, Gelgor I, Gursel M

Objectives: To evaluate the efficacy of conventional surgery and electro-surgical gingivectomy to remove gingival clefts with respect to periodontal health and patient tolerance.

Design: A split mouth randomized controlled trial.

Setting: Turkey.

Participants: Twenty-two patients, undergoing treatment with edgewise appliances and the bilateral loss of premolars, who had bilateral and symmetrical gingival clefts following canine retraction.

Interventions: All patients had initial periodontal therapy prior to surgery. The gingival clefts were excised using either conventional surgical techniques or electro-surgery.

Outcome measures: The vertical length and horizontal depth of the clefts, gingival index and the patients' pain and discomfort levels.

Results: The groups were comparable pretreatment. There was a significant reduction in the length and depth of the clefts in both groups following treatment. However, there were no statistically significant differences between the two groups in the size of the clefts (depth $p=0.19$; length $p=0.22$), the gingival index ($p=0.32$) or pain scores (2 hours $p=0.65$; 24 hours $p=0.81$) after treatment.

Conclusions: Conventional surgery and electro-surgery reduce the size of gingival clefts in premolar extraction sites, but neither technique offers any significant advantage over the other with respect to gingival health or patient discomfort.

Implications: This study suggests that both conventional surgery and electro-surgery are effective at reducing gingival clefts. It may be worthwhile conducting a larger and longer-term study to see if the gingival health is maintained and/or the surgical removal of the gingival clefts in extraction sites reduces the potential for space to reopen.

An *in vitro* evaluation of shear bond strengths and *in vivo* analysis of bond survival of indirect-bonding resins. *Angle Orthod* 2004; 74: 405–9.
Polat O, Laraman AI, Buyukyilmaz T

Objectives: To compare the bond survival rate of two adhesive systems developed for indirect bonding.

Design: A split mouth controlled clinical trial.

Setting: Turkey.

Participants: Fifteen patients undergoing upper and lower arch fixed appliance therapy.

Interventions: Upper left and lower right quadrants: brackets bonded with Sondhi's indirect-bonding resin. *Upper right and lower left quadrants*: Therma Cure as a laboratory resin and Custom IQ as a bonding system.

Outcome measures: The failure rate of brackets over 9 months.

Results: Two-hundred-and-ninety-five brackets were bonded. There were 13 bond failures—6 (4.1%) in the Sondhi group and 7 (4.8%) in the Therma Cure/Custom IQ group.

Conclusions: Sondhi's indirect-bonding resin and Therma Cure/Custom IQ bonding system appear to have similar clinical failure rates over nine months' treatment.

Implications: This study suggests that clinically both bonding systems are equally effective. However, this was a small study carried out over 9 months. It may therefore be worthwhile conducting a larger and

longer-term study to see if this is maintained over the whole course of treatment.

Orthodontics and Craniofacial Research

Meta analysis of the treatment-related factors of external root resorption. *Orthod Craniofac Res* 2004; 7: 71–8.
Segal GR, Schiffman PH, Tuncay OC

Objectives: To determine treatment-related aetiological factors associated with external apical root resorption (EARR).

Design: A systematic review with meta-analysis.

Data sources: Medline was searched using appropriate MeSH terms. Reference lists were examined to identify publications not listed on Medline.

Study selection: Studies were included if they were published in English and reported on the EARR in maxillary incisors following fixed appliance therapy in more than 10 subjects. Pre- and post-treatment radiographs had to be available and the total apical displacement reported.

Data extraction: Three reviewers independently extracted data on the study design, control group, sample size, treatment assignment and duration, mean root resorption, mean age and SD of patients, method of data collection, type of radiographs used, distance the apex moved, total apical distance moved. Criteria were scored and weighted as to methodological quality.

Data synthesis: Data from each study were weighted according to its meta-analysis factor and then a correlation matrix, of the variables studied, was constructed.

Results: The search strategy identified 150 potentially eligible studies, of which 9 were included. The mean root resorption was 1.42 mm (SD 0.45 mm) and mean apical displacement was 2.38 mm (SD 0.76 mm). The weighted correlation between root resorption and apical displacement was 0.82 and with length of treatment was 0.85.

Conclusions: When data were weighted, the distance the apex moved and the length of treatment were strongly correlated with the mean apical root resorption.

Implications: The mean amount of apical root resorption is relatively small and is probably clinically insignificant unless patients experience bone loss later in life. This study has identified two treatment-related, rather than patient-related, factors that have a strong correlation with apical root resorption. It may therefore be possible to identify patients who are more likely to suffer from root resorption, which will help in the process of gaining informed consent to treatment.

Root resorption and its association with alterations in physical properties, mineral contents and resorption craters in human premolars following application of light and heavy forces. *Orthod Craniofac Res* 2004; 7: 79–97
Darendeliler MA, Kharbanda OP, Chan EKM, Srivicharnkul P, Rex T, Swain MV, *et al.*

Objectives: To determine the effect of light and heavy orthodontic forces on the physical properties and mineral composition of cementum and the size of resorption craters.

Design: A split-mouth randomized controlled trial.

Setting: Sydney, Australia.

Participants: Sixteen patients who provided 36 first premolars.

Interventions: Each patient had an active sectional appliance on one side of the arch and a passive one on the other side. Beta-titanium-molybdenum alloy springs were activated to deliver 25 or 225 g to randomly selected first premolars. The teeth were extracted after 28 days and stored in sterilized deionized water until testing began.

Outcome measures: The hardness, elastic modulus, mineral composition and contents of cementum and the site and volume of resorption craters.

Results: There were no significant differences in the hardness ($p=0.94$) or elastic modulus ($p=0.15$) of the cementum from the teeth in the light (25 g) or heavy (225 g) force groups. There was little change in the mineral composition of the cementum in the light force group but in the heavy force group there was a significant ($p<0.001$) decrease in the Ca^{2+} concentration in areas of periodontal ligament tension. The mean volume of the resorption craters in the light-force group was 3.49 times greater than in the control group and the heavy force group 11.59 times greater ($p<0.001$). The heavy force group had 3.31 times greater total volume of resorption than the light force group ($p<0.001$).

Conclusions: Varying levels of force appear to have little effect on the physical properties of the cementum, but heavy (225 g) forces were associated with significantly greater sized areas of resorption.

Implications: It appears that heavy orthodontic forces (225 g) cause a larger volume of resorption than light (25 g) forces so clinicians need to take care in the amount of force delivered to teeth in order to minimize the amount of resorption. It would seem worthwhile to undertake longer-term studies to assess the ability of the root to repair, but ethical considerations may preclude this.