Abstracts

A comparison of shear bond strength of immediate and delayed bonding of brackets to FRC bars using various orthodontic adhesives
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Background: Fibre reinforced composite bars (FRC) have applications as bonded retainers, space maintainers and anchorage/movement units. However, the bond strength of attachments to FRC anchorage bars is unknown.

Aims: To compare the shear bond strengths of brackets bonded immediately to FRCs with different orthodontic adhesive systems and bonded with the same adhesives after a 48-hour delay, abraded with a diamond bur and etched with phosphoric acid.

Method: One hundred and five recently extracted upper premolars were randomly assigned to seven groups (N = 15 teeth per group). FRCs were bonded to the buccal surfaces of the teeth and stainless steel orthodontic brackets were bonded to the FRCs with the following adhesive systems: Group 0 (Tetric Flow); Groups 1, 2 and 3 (Immediate bonding with chemically cured, no-mix and light cured composites, respectively, the bars covered with Tetric Flow); Groups 4, 5 and 6 (Bonding to FRCs delayed 48 hours, then bonded with chemically cured, no-mix and light cured composites, respectively, the bars covered with Tetric Flow). The FRC bars in Groups 4, 5 and 6 were abraded with a coarse-grit diamond bur before bonding the attachments to the bars. The shear bond strengths (SBS) were measured with a universal testing machine, and the adhesive remaining on the teeth after debonding was scored with the Adhesive Remnant Index (ARI). Data were analysed using analysis of variance (ANOVA), Duncan’s post-hoc and Fisher’s Exact test.

Results: There were no statistically significant SBS differences between Groups 0 (Mean SBS: 9.56 MPa), 1 (Mean SBS: 9.74 MPa), 2 (Mean SBS: 10.72 MPa) or 3 (Mean SBS: 9.54 MPa). Groups 4, 5 and 6 (Bonding delayed by 48 hours) had SBSs of 11.79 MPa, 11.63 MPa and 13.11 MPa, respectively, and were significantly higher than the SBSs in Groups 1, 2 and 3 (Immediate bonding). There were no significant differences in ARI scores among the groups.

Conclusions: The mean SBSs in all groups fell within the clinically acceptable range (> 7 MPa). The combination of a 48-hour delay between placement of an FRC bar and bonding an attachment, abrading the FRC with a diamond bur and etching with phosphoric acid resulted in higher bond strengths.

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The effects of the Pendulum distalising appliance and cervical headgear on the dentofacial structures
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Background: Headgears are effective in distalising maxillary molars, but success depends on patient compliance and tolerance. Intra-oral distalising appliances are simple to construct and use and may be a better alternative for patients who are non-compliant or cannot tolerate headgear.

Aims: To compare the Pendulum (PEN) appliance and cervical headgear (CHG) on distal movement of maxillary first molars in patients requiring maxillary molar distalisation.

Methods: Thirty patients were randomly divided into two groups. Both groups had comparable occlusal and cephalometric characteristics before treatment. Fifteen patients (9 girls, 6 boys) with a mean age of 11.45 ± 1.54 years (Range: 8.58–13.50 years) were treated with Pendulum appliances and 15 patients (10 girls, 5 boys) with a mean age of 11.72 ± 1.24 years (Range: 9.58–13.33 years) were treated with a Ricketts-type CHG. A pilot study of four patients estimated that the time required to distalise the maxillary molars with the Pendulum appliance was five months. Therefore, the end of treatment records for the CHG group were taken after 4.96 ± 0.35 months. Lateral and postero-anterior cephalometric radiographs were taken of both groups at the start (T1) and end of distalisation/treatment (T2). Changes in cephalometric measurements in the two groups were compared with Wilcoxon and Mann-Whitney U tests.

Results: Measurements indicated that U6-ANS distance, overjet and U1-APo distance increased, U6-PP angle and U6-PTV distance reduced, and the molar relationship improved more in the PEN group compared with the CHG group. Statistically, significant right molar–left molar differences were found between the two groups. Distalisation produced significant side effects, resulting in distal tipping of the first molars and an increase in overjet, whereas the CHG reduced the overjet.

Conclusion: The Pendulum appliance was more effective than the CHG in distalising the maxillary first molars.

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Comparison of dietary intake between fixed orthodontic patients and control subjects
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Background: Adolescence is a period of rapid physiological and psychological development which is associated with an increased demand in nutritional requirements. Orthodontic therapy is also commonly initiated during this phase of life and nutritional intake may also change during treatment.

Aims: To compare the nutrient intakes of adolescents wearing fixed orthodontic appliances and a control group matched for age and gender.

Method: A total of 180 patients aged between 15 and 17 years participated in this study (90 in the study group and 90 controls). Demographic data were collected by questionnaire and dietary intake was assessed using a 24-hour memory recall and was analysed using Dietplan6 software (Forestfield Software Ltd, UK). Comparisons between groups were assessed by the Independent sample t-test and the SPSS was used for statistical analysis.

Results: Orthodontic patients consumed a similar number of total calories, protein and carbohydrate (p > 0.05); however, they had a greater intake of total fat, saturated fat, monosaturated fat, polysaturated fat, linolenic fat, linoleic fat and cholesterol and significantly lower intake of fibre, chromium and betacarotene (p < 0.05) compared with the Control group. The intake of other macro- and micro-nutrients did not differ significantly between groups.

Conclusions: Adolescents receiving orthodontic treatment have an altered dietary intake that can be harmful to their health. As adolescents are at a critical stage of development and dietary intake is of particular importance, it is recommended that targeted nutritional guidance is provided to patients during orthodontic treatment.

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Evaluation of primary surgical outcomes in New Zealand patients with unilateral clefts of the lip and palate
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Objective: To evaluate and compare the primary surgical outcomes of complete unilateral cleft lip and palate (UCLP) patients in two New Zealand cleft care centres.

Methods: This is a retrospective study of two providers of cleft care in New Zealand: Centre A in the North Island and Centre B in the South Island of New Zealand. Pre-orthodontic study models were evaluated from 28 UCLP patients from Centre A with primary surgical repairs performed between 1987–1999 and 31 UCLP patients from Centre B with primary surgical repairs performed between 1984–2000. Dental arch relationships were measured using the Goslon Yardstick. A Goslon score of 1 is considered to be an excellent outcome, whereas a score of 5 is a very poor treatment outcome.

Results: Intra- (Kappa: 0.84 – 0.93) and inter-examiner (Kappa: 0.63 – 0.69) reliabilities revealed good to very good agreement between examiners using the Goslon Yardstick. The mean Goslon score for Centre A was 3.5, with no cases in Group 1, five cases in Group 2 (17.9 per cent), nine cases in Group 3 (32.1 per cent), 11 cases in Group 4 (39.3 per cent) and three cases in Group 5 (10.7 per cent). The mean score for Centre B was 3.1, with one case in Group 1 (3.2 per cent), nine cases in Group 2 (29.0 per cent), eight cases in Group 3 (25.8 per cent), 11 cases in Group 4 (35.5 per cent) and two cases in Group 5 (6.5 per cent). There were no statistically significant differences between the two centres (p > 0.05).

Conclusions: The outcome scores from the two cleft centres, based on historic records, were disappointing and higher than expected. It is recommended that a review of primary surgical protocols be implemented to ensure outcomes comparable with international standards. The results provide useful benchmarks for future comparisons of treatment.

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The effects of various surface treatments on the shear bond strengths of stainless steel brackets to artificially-aged composite restorations

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Objective: To compare the shear bond strengths (SBS) of stainless steel brackets bonded to artificially-aged composite restorations after different surface treatments.

Methods: Forty-five premolar teeth were restored with a nano-hybrid composite (Tetric EvoCeram), stored in deionised water for one week and randomly divided into three equal groups: Group I, the restorations were exposed to 5 per cent hydrofluoric acid for 60 seconds; Group II, the restorations were abraded with a micro-etcher (50 μm alumina particles); Group III, the restorations were roughened with a coarse diamond bur. Similar premolar brackets were bonded to each restoration using the same resin adhesive and the specimens were then cycled in deionised water between 5 °C and 55 °C (500 cycles). The shear bond strengths were determined with a universal testing machine at a crosshead speed of 1 mm/min. The teeth and brackets were examined under a stereomicroscope and the adhesive remnants on the teeth scored with the adhesive remnant index (ARI).

Results: Specimens treated with the diamond bur had a significantly higher SBS (Mean: 18.45 ± 3.82 MPa) than the group treated with hydrofluoric acid (Mean: 12.85 ± 5.20 MPa). The mean SBS difference between the air-abrasion (Mean: 15.36 ± 4.92 MPa) and hydrofluoric acid groups was not significant. High ARI scores occurred following abrasion with a diamond bur (100 per cent) and micro-etcher (80 per cent). In approximately two thirds of the teeth no adhesive was left on the restoration after surface treatment with hydrofluoric acid.

Conclusion: Surface treatment with a diamond bur resulted in a high bond strength between stainless steel brackets and artificially-aged composite restorations and was considered to be a safe and effective method of surface treatment. Most of the adhesive remained on the tooth following surface treatment with either the micro-etcher or the diamond bur.

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A systematic review of the association between appliance-induced labial movement of mandibular incisors and gingival recession

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Objective: To determine if an association exists between appliance-induced labial movement of mandibular incisors and gingival recession.

Methods: Electronic databases were searched for studies with the terms: ‘incisor’, ‘incisor proclination’, ‘tooth movement’, ‘orthodontic tooth movement’, ‘gingival recession’ and ‘orthodontic appliance’. The original articles and abstracts that met the initial inclusion criteria were retrieved, and their references hand searched for possible articles missed by the database searches. Inclusion criteria included human studies that suggested a link between labial movement of lower incisors produced by orthodontic treatment and gingival recession. Exclusion criteria included significant intrusion or extrusion of the mandibular incisors, periodontal disease, subjects taking medication that affects gingival health and subjects with systematic diseases.

Results: Seven articles fulfilled the selection criteria. Gingival recession after labial movement of lower incisors was assessed on dental casts, intra-oral slides, lateral cephalograms and gingival examination. The articles were analysed to determine the impact of their treatment methodology on the outcomes.

Conclusions: No association between appliance-induced labial movement of mandibular incisors and gingival recession was found. Factors that may lead to gingival recession after orthodontic tipping and/or translation movement were identified as a reduced thickness of the free gingival margin, a narrow mandibular symphysis, inadequate plaque control and aggressive tooth brushing.

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Skeletal, dental and soft tissue changes in Class III patients treated with fixed appliances and lower premolar extractions

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**Background:** Mild Class III malocclusions can be treated by upper incisor proclination and lower incisor retroclination following extraction of the lower first premolars.

**Aims:** To compare the skeletal, dental and soft tissue changes in Class III patients treated with fixed appliances, Class III traction and lower first premolar extractions with the changes in a group of untreated Class III patients.

**Methods:** The Treatment group consisted of 30 Class III patients (Mean age 13.69 ± 1.48 years) who were treated by upper and lower fixed appliances, Class III intermaxillary traction and lower first premolar extractions for 2.88 ± 1.12 years. The Control group consisted of 20 untreated Class III patients (Mean age 13.51 ± 0.95) matched for age and gender. The T1 to T2 changes in the treated and untreated groups were compared using a paired t-test while differences between the two groups were compared with an independent t-test.

**Results:** During treatment, the upper incisors were proclined about 1 degree and the lower incisors were retroclined 8 degrees. Small, but statistically significant changes in SNB, Wits and the overlying soft tissues accompanied the changes in incisor inclination. At the end of treatment a positive overbite and overjet were achieved. The increase in lower facial height in the Treatment group was comparable with the change in the Control group.

**Conclusions:** A range of mild to moderate Class III malocclusions can be treated by dentoalveolar compensation.

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Presence of cariogenic streptococci on various bracket materials detected by polymerase chain reaction
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Objective: To determine the in vivo presence of Streptococcus mutans and Streptococcus sobrinus on different bracket materials and to correlate the prevalence with the Visible Plaque Index (VPI) and the Gingival Bleeding Index (GBI).

Methods: Orthodontic brackets made of different materials (stainless steel, gold, ceramic, plastic) were bonded to the upper and lower second premolars in 40 subjects receiving fixed orthodontic appliances. After 30 days, the brackets were debonded and the presence of S. mutans and S. sobrinus on the brackets was determined using the polymerase chain reaction (PCR) technique. The VPI and GBI were recorded and the relationship between the prevalence of the streptococci and the level of oral hygiene was calculated.

Results: There were fewer S. mutans and S. Sobrinus over the surface of gold and stainless steel brackets compared with the plastic and ceramic brackets. A statistically significant difference was observed in S. mutans and S. sobrinus prevalence between the metal brackets and the aesthetic brackets. However, there were no statistically significant differences in S. mutans and S. Sobrinus prevalence when the gold and stainless steel brackets were compared. Comparison between the plastic and ceramic brackets revealed a similar finding. Furthermore, a significant correlation was found between the in vivo prevalence of S. mutans and S.sobrinus and the oral hygiene indices (p < 0.05), suggesting that the oral hygiene indices could be a good indicator of S. mutans and S. sobrinus prevalence.

Conclusions: Since microbial adhesion is greater on aesthetic brackets, good oral hygiene during treatment should be emphasised.

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Effectiveness and acceptability of Essix and Begg retainers: a prospective study
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Background: Retainers vary in their effectiveness in maintaining teeth in their treated positions and in their acceptability by patients.

Aims: To compare the effectiveness and acceptability of Essix and Begg retainers.

Methods: Two hundred and twenty-four patients were randomly assigned to receive either upper and lower Essix or upper and lower Begg retainers. Subject acceptability was evaluated with seven questions related to chewing and biting, fit, speech, appearance, oral hygiene, comfort and maintenance recorded on a 10-point visual analogue scale. The effectiveness of the retainers to maintain alignment was assessed on study models taken on the day after debonding (T1), after three months retention (T2) and six months retention (T3) with the Peer Assessment Rating (PAR) and Irregularity Index (II). In addition to the upper and lower retainers, all subjects had bonded lower lingual retainers placed at the end of active treatment.

Results: There were small, but statistically significant, deteriorations in the PAR scores in both groups at T2 and T3. The T2-T1 and T3-T1 differences between the groups were statistically significant (Begg > Essix), but the differences did not exceed 2 points. For the Irregularity Index, the T3-T1 difference was statistically significant (Begg > Essix), but clinically insignificant as the difference was only 0.25 points. Subjects preferred the Begg retainer for chewing and biting ($p = 0.000$), and liked the appearance ($p = 0.000$) and comfort ($p = 0.05$) of the Essix retainers. The subjects in both groups reported both retainers had an acceptable fit.

Conclusions: More subjects wearing Essix retainers considered their retainers were comfortable and had an acceptable appearance than subjects wearing Begg retainers, and more subjects with Begg retainers considered that their retainers were acceptable for biting and chewing than the subjects wearing Essix retainers. Both retainers allowed some relapse of teeth post-treatment, but the 6-month differences were small and may not be clinically significant.

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Orthodontic management of ectopic maxillary first permanent molars: a case report
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Background: Ectopic position of a maxillary first permanent molar results in a local malocclusion within the mixed dentition and occurs when the tooth erupts more mesially to its normal path of eruption. The prevalence of ectopic maxillary first permanent molars has been reported at approximately 4 per cent. Possible treatment options include the extraction of the primary second molar and the placement of a space maintainer, extraction of the primary second molar and later regaining lost space during comprehensive treatment of the malocclusion or implementing interceptive treatment to disimpact the maxillary first permanent molar and preserving arch length.

Aim: To describe the aetiology, classification and management of ectopic maxillary first permanent molars and to present two cases of intervention using simple orthodontic appliances.

Methods: A sectional fixed appliance and orthodontic separators were used to correct the ectopic maxillary first permanent molars.
Results: Successful disimpaction resulted in normal vertical eruption and arch length preservation.

Conclusions: Management of ectopic maxillary first molars can be successfully achieved in the mixed dentition.

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Alignment of an ectopic canine with mini-implant anchorage: a case report
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Aims: To describe the treatment of an ectopic maxillary left canine and Class II molar relationship in a 12 year-old girl.

Methods: A pendulum appliance was used in a first phase of treatment to distalise the maxillary molars to a Class I molar relationship. In the second phase of treatment, a mini-implant, inserted between the roots of the left maxillary central and lateral incisors, provided anchorage to move an ectopic maxillary left canine into position.

Results: The implant remained stable throughout treatment and a maxillary canine – first premolar transposition was corrected. Good overjet and overbite were achieved and have been maintained one year after completion of active treatment.

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Treatment of a Class III patient: a case report
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Background: The skeletal Class III malocclusion may be characterised by mandibular prognathism, maxillary deficiency or both.

Aim: To describe the early treatment of a skeletal Class III patient.

Methods: This case report presents a 10 year-old boy with a Class III malocclusion comprising a combination of maxillary deficiency and mandibular prognathism. Two treatment plans were considered. The first was to correct maxillary deficiency at an early age, while the second aimed to postpone treatment until after skeletal growth completion and then offer bimaxillary surgery. The case was treated early and a tongue appliance was used for maxillary protraction.

Results: The post-treatment SNA angle showed a 5 degree increase and a positive overbite and overjet were achieved after 23 months of active treatment. However, mandibular prognathism was still evident.

Conclusion: Both treatment options have advantages and disadvantages which require informed clinical consideration.

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