The effects on the mandibular condyle of Botox injection into the masseter are not transient

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**Background:** The classification of temporomandibular joint disorders (TMDs) includes temporomandibular joint (TMJ) conditions, masticatory muscle disorders, headaches and deformities of related structures. Botulinum neurotoxin (Botox) injections are used as adjunctive treatments for the relief of orofacial pain associated with TMD and its effects are achieved via the blocking of acetylcholine release, resulting in an inability of muscles to contract. However, some studies have warned that there are negative effects in the craniofacial structures, such as a decrease in condylar bone volume and cartilage thickness. The aims of this study were to evaluate the short and long term effects of Botox on mandibular condylar cartilage and masseter muscle.

**Materials and methods:** This animal study consisted of two treatment groups and two controls with a total of 32 mice sacrificed. Both of the treatment group mice were injected with Botox into the right masseter only, group one was dissected at four weeks and group two at eight weeks. The muscular, skeletal and cartilaginous tissues were compared and contrasted against the tissues of the non-injected controls following dissection at the respective time frames. Microscopic computed tomography, photography and histology were key examined parameters.

**Results and discussion:** The results indicate that the effects of Botox were not transient and persist over longer periods of time in all aspects examined. Muscular atrophy of the injected side occurred and was more severe at eight weeks compared to four weeks. There was a reduction in bone volume and turnover as a result of a decrease in osteoblast activity, along with an increase in cell apoptosis and reduction in cartilage thickness. The authors displayed the experimental findings through clear and distinct images, graphs and a table. It was acknowledged that limited long-term studies exist; however, there was a failure to stress that extrapolation of these results into human clinical scenarios should be done with caution given that this is an animal study.

**Conclusion:** This study gives support to other rodent studies on the effects of Botox injections whilst delivering new findings on the effects of cartilage thickness. This study may be foretelling the results of future human based studies and, if so, it is a worrying sign given the increase in Botox injections for non-therapeutic purposes.

Miodrag Mladenovic

The effects of fixed orthodontic retainers on periodontal health: a systematic review

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**Scope and aim:** Retention after orthodontic treatment remains one of the greatest challenges in orthodontics. The risk of relapse is unpredictable and impacts a high proportion of post-orthodontic patients. There is no consensus for the ideal duration of retention; however, the first eight-month post-treatment period, when the remodelling of the periodontal fibres occurs, appears to be critical. Most clinicians choose a retention period longer than eight months and often recommend lifelong retention for all patients. Fixed and removable retainers continue to be the most common retention method. Fixed orthodontic retainers are compliance free, invisible, and worn continuously. However, teeth are more prone to plaque and calculus accumulation, and appropriate oral hygiene procedures are more
complex and require more time. Widespread use of fixed retainers and the need for long-term wear demonstrate the importance of assessing the effects of this increased accumulation on deposits on the periodontium. The objective of this systematic review was to assess the available evidence in the literature regarding the effects of fixed orthodontic retainers on periodontal health.

**Materials and methods:** The Preferred Reporting Items for Systematic Reviews and Meta-Analyses were followed in reporting this systematic review; however, the protocol was not registered in a publicly assessable database.

The following databases were searched from 1946 to August 31, 2019: Medline, EMBASE, the Cochrane Oral Health Group’s Trials Register, CENTRAL, ClinicalTrials.gov, the National Research Register, and Pro-Quest Dissertation Abstracts and Thesis database. There were no language exclusions. Randomised controlled trials (RCTs), controlled clinical trials, cohort studies of prospective and retrospective design, and cross-sectional studies reporting on periodontal measurements of patients who received fixed retention after orthodontic treatment were eligible for inclusion. The quality of the included RCTs was assessed per the revised Cochrane risk of bias tool for randomised trials (RoB 2.0), whereas the risk of bias of the included cohort studies was assessed using the Risk Of Bias In Non-randomised Studies of Interventions tool. A modified version of the Newcastle-Ottawa scale was used for cross-sectional studies.

**Results and discussion:** Twenty-nine studies fulfilled the authors inclusion criteria and were included in this systematic review. Of the 29 studies, 11 were RCTs, four prospective cohort studies, one retrospective cohort study, and 13 cross-sectional studies.

The RCTs were all found to have an unclear to high risk of bias. Three of the cohort trials had an overall moderate risk of bias, and therefore appeared to provide sound evidence for non-randomised studies. None of the 13 cross-sectional studies were found to have a low risk of bias mostly because of the lack of blinding and an adequate control of confounding factors.

Because of the great heterogeneity in study designs, types of wire used, comparisons made, outcomes reported, and overall low quality of the included studies, a meta-analysis was not conducted. The qualitative analysis discussed the studies in five broad categories: (1) fixed retainers vs no retainers, (2) fixed retainers vs removable retainers, (3) different time-points of the same patients, (4) comparison of different fixed retainers, (5) different vertical wire positions.

Within all categories, a similar range of results was found with most of the included studies, indicating that fixed retainers do not affect periodontal health. There was, however, a small number in each category that were a contrast to this general consensus, reporting poorer periodontal conditions in the presence of a fixed retainer (two RCTs, one prospective cohort study, and two cross-sectional studies).

One RCT showed that fibre-reinforced composite retainers could be associated with periodontal complications but found unclear results for multistranded wire retainers. However, no severe detrimental effects on periodontal health were reported in any of the included studies. Two studies also showed that positioning the retainer more incisally or more gingivally did not seem to influence the periodontal outcomes.

Two studies reported that more gingival inflammation was present in the lingual areas of participants without a fixed retainer, likely due to the fact that patients with a fixed retainer had more regular recalls and so improved oral hygiene.

**Critical appraisal:** This systematic review is similar in quality to most in orthodontic literature; other than the fact that it was not registered, it had similar limitations, most of which were addressed in the discussion.

The first is the high amount of methodological heterogeneity in the study designs, types of wire used, comparisons made and outcomes, which could be identified across the included studies. A second limitation was the lack of high-quality evidence. All included RCTs were, indeed, at an unclear or high risk of bias. Most had issues with the blinding of the outcome(s) assessor(s), which will be a recurrent problem in prospective studies since the intervention appraised is evident and easy to detect. All the cross-sectional studies were found as unsatisfactory and only three prospective studies were found to have a moderate risk of bias.

Another limitation was the observation period of the included studies. The follow-ups of the included
RCTs and cohort studies ranged from four months to four years and from two months to five years, respectively. Some of the included cross-sectional studies had longer follow-up periods but their quality was questionable.

**Conclusion:** While there is no compelling evidence that fixed retention causes severe detrimental effects on the periodontium and most studies suggest there is no difference, the fact there are a few studies that do report this, show the evidence is not definitive. More high-quality randomised control trials, with prolonged periods of follow-up, are required. It is important to remember, as two studies in the systematic review highlighted, with improved periodontal outcomes in the fixed retainer groups because of more regular attendance, oral hygiene was identified as the most important factor. Patients’ oral hygiene and regular professional visits are essential to maintain periodontal health with or without fixed retention.

**Emma Bowman**

**Do malocclusion and orthodontic treatment impact oral health? A systematic review and meta-analysis**

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*Am J Orthod Dentofacial Orthop 2020; 157: 738-744.e10*

**Background:** Orthodontic treatment is widely provided following a clear demand for treatment by patients. Current evidence has mostly evaluated the results of orthodontic treatment from a clinical perspective such as Andrew’s six keys or the PAR index, and little has been investigated on the benefits to a patient’s oral health and their quality of life. Previous systematic reviews by Javidi et al. (2017) and Shaw et al. (1980) have highlighted a lack of evidence and no improvement after almost 40 years of research on this topic. Therefore, the aims of this study were to (1) investigate the impact of a malocclusion on oral health and (2) investigate the effect of orthodontic treatment on oral health.

**Methods:** The participants of this systematic review were children (aged 18 years and younger) who presented with a malocclusion and/or who had been orthodontically treated. The date range of the article searches were from 1st January 1990 to 8th October 2018. The inclusion criteria for the 1st aim were studies that investigated the relationship between malocclusion and oral health, possessed a control group of patients without a malocclusion and included a valid tool of malocclusion assessment such as the Index of Orthodontic Treatment Need (IOTN). The 2nd aim’s inclusion criteria were studies that assessed oral health outcomes at pre- and post-orthodontic treatment, possessed a control group of patients who did not experience orthodontic treatment and were designed as randomised control trials or prospective trials. The search excluded studies that used radiological measurements, ultrasound scans or bite registration as outcomes, assessment of bonding techniques, split-mouth studies, compliance assessments and orthognathic surgeries.

**Results:** The search identified 3,471 records; however, after screening and eligibility assessments the final sample included 20 studies. The overall quality of the identified studies was low as they all had at least one quality domain affected by bias. The most common reason for poor quality was the lack of clarity on participant sampling and the omission of non-responder and response rate information. Malocclusion showed a positive correlation with dental trauma. Of the 13 useable studies, it was found that if a child had an overjet of more than 5 mm, the odds ratio of them suffering trauma to their incisors was 1.98. Out of the nine studies included for caries and periodontal disease, eight could not be used as investigators only reported whole-mouth outcomes and did not report on localised morphologic features of malocclusion that could cause dental disease. One study by Ashley et al. (1998) reported localised irregularity being associated with gingivitis; however, there was no association with plaque accumulation. There were five included studies that assessed oral health-related quality of life (OHRQoL) and malocclusion; however, all had significant limitations. OHRQoL outcomes were measured as composite scores and included components not related to malocclusion such as pain. There was significant heterogeneity in the studies’ scoring systems and no consensus could be reached. Benson et al. (2015) was the only prospective study that provided more information; however, the quality of evidence was still low. A significant improvement in OHRQoL was found over time and orthodontic treatment appeared to have minimal effect.

**Discussion:** There is an absence of reliable evidence on malocclusion and oral health, except for an association between dental trauma and an increased overjet. The
findings from this review were disappointing as the question Shaw et al. first posed of an association between malocclusion and orthodontic treatment to oral health in 1984 remained unanswered. This systematic review employed a critical appraisal of the included evidence in which most of the studies were rejected due to their use of arbitrary or absent cut off points, a lack of uniformity in study design or non-localised components of malocclusion for assessment. Unfortunately, an ideal study design will be difficult to perform to address this topic. Long-term prospective studies will likely have significant issues with retention and short-term studies will not give certainty. Cross-sectional studies need to recruit subjects randomly or consecutively, and non-responders need to be identified for certain characteristics or reasons for their non-response. Randomised control trials with long-term observation of treatment and no treatment subjects would be ideal; however, it would not be ethical.

**Conclusion:** Apart from trauma, there was an absence of evidence on the effects of malocclusion and the impact of orthodontic treatment on oral health. The answers may never be found due to the limitations of the study designs needed to address these topics.

Shaun Goh

**Has Invisalign improved? A prospective follow-up study on the efficacy of tooth movement with Invisalign**

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**Objective:** To provide an update on the accuracy of tooth movement using the Invisalign appliance.

**Methods:** This was a prospective clinical study conducted in a private orthodontic clinic. Thirty-eight patients (mean age 36 years) were treated with either Invisalign full or Invisalign Teen. The mean number of aligners was 21 in the maxilla and 20 in the mandible. The treatment was provided by an orthodontist experienced in the use of the Invisalign system, and the ClinCheck was designed according to preference (over-engineering, IPR and attachments as required). The patients were instructed to wear aligners for 22 hours per day, with a 10-day wear protocol. Compliance was verbally confirmed at each appointment. Poor compliance was noted as an exclusion criterion. Three patients were excluded due to incomplete treatment at the time of final data collection and three patients had errors in their final scan.

The primary outcome of the study was the level of accuracy. This was calculated as the percentage of the predicted tooth movements that were achieved. Tooth movements measured were mesial-distal crown tip, buccal-lingual crown tip, intrusion, extrusion and rotation. In addition, half of the sample was randomly selected and evaluated using the ABO cast evaluation system scores.

**Results:** The average treatment duration was 8.5 months. The mean accuracy of all planned tooth movements was 50%. The highest overall accuracy was bucco-lingual crown tip (56%) and the lowest overall accuracy was rotation (46%). Looking more specifically at individual teeth, the most accurate movement was labial crown tip of the maxillary lateral incisor (70%) and the least accurate movement was mesial rotation of the mandibular first molar (28%). 74% of cases would have been allocated a passing score for the ABO cast evaluation.

**Critical appraisal:** The majority of clinical studies on Invisalign have been retrospective or lacking in sample size; hence, it is hugely valuable to have a prospective clinical trial with an experienced Invisalign provider to further clinical understanding of this appliance. The ‘over-engineering’ presents an interesting and challenging addition to the study. Over-engineering the ClinCheck may compensate for some of the biomechanical shortcomings of aligners, thus the overall accuracy becomes less important than the clinical outcome. The addition of the ABO cast evaluation was a valuable addition to interpretation of the outcome. The passing score suggests the cases were treated to a high standard regardless of the mediocre performance of the appliance.

This study followed the 2009 study by the same treating clinician (N Kravitz). Although the methodology was vastly different in so far as the posterior teeth were included, the aligner wear protocol was reduced, sequencing and over-engineering of tooth movement was planned, it is still noteworthy that the mean accuracy improved from 41% to 50%. Tipping movements remain a strength of the appliance while rotation and intrusion remain the weakness.

A limitation noted by the authors is the tremendous variation in attachment design and over-engineering
planned among orthodontists. This is essential for successful clinical outcomes but the extent of the over-engineering and attachment design for certain movements would be a clinically relevant direction for further research.

Julia Smith

Orthodontists’ and parents’ perception of finished occlusion and willingness to extend treatment time

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Background: Shorter orthodontic treatment times are desired by clinicians, patients and their parents. However, it is unclear whether orthodontists and parents are willing to accept a compromised final result in order to reduce time in treatment.

Objectives: This study aimed to compare parents’ and orthodontists’ opinions on different finished occlusions and assess their willingness to continue treatment to improve the final outcome.

Methods: Surveys were sent to 1,000 orthodontists and 750 parents of children undergoing orthodontic treatment. The participants were asked to consider seven simulated final occlusions with well-aligned teeth. The occlusions were altered by moving the lower cast in 1 mm increments from a 3 mm Class II occlusion, through Class I, to a 3 mm Class III occlusion. Each participant rated the acceptability of each final occlusion using a 100 mm visual analogue scale (VAS). They were also asked how long they would extend treatment time to improve the final result. The impact of time in treatment (18 months versus 24 months) and patient compliance (good versus poor) on participants’ responses were also evaluated. The order in which the occlusions were presented to each participant was randomised.

Results: The surveys returned a 23% and 32% response rate from orthodontists and parents, respectively. Both parents and orthodontists agreed that the Class I occlusion was the most acceptable and the 3 mm Class III the least. Overall, a clear pattern of acceptability was displayed in all responses, with scores decreasing as occlusions deviated from Class I. Parents were more likely to want to end treatment and for a longer period than orthodontists (p < 0.0001). Parents were also less likely to want to extend treatment prematurely (p < 0.05). The amount of time in treatment did not appear to have any influence on VAS ratings in either group, but patient non-compliance was found to significantly increase the acceptability of each occlusion. Parents were prepared to extend treatment time regardless of compliance, compared to orthodontists who were more reluctant to extend treatment time for non-compliant patients (p < 0.05). Both samples were more willing to prolong treatment if a patient had received treatment for 18 months compared to 24 months (p < 0.05).

Critical appraisal: This was a simple study with clearly defined methodology and objectives. Although the authors did not include a power calculation, the response rate to the survey appeared to be sufficient to draw meaningful conclusions from the results. However, the authors did not specify what type malocclusion affected the cases nor the severity. These factors would likely have some impact on the parents’ responses regarding occlusion acceptability. It was also unclear how the patient clinics were selected. Given that adolescents and children still make up the majority of patients in many orthodontic clinics, it is unclear why the authors feel younger patients would be an inappropriate sample.

Conclusions: In the days of fast-braces, this study provides timely reassurance to clinicians that parents are more prepared to extend treatment time to ensure a quality finished occlusion than the anecdotal evidence suggests. There appears to be clear agreement between orthodontists and parents on the acceptability of different occlusions, and parents are more willing than orthodontists to prolong treatment, and for a longer period of time, to improve the final outcome.

Nicholas Pittar
Does anchorage loss differ with 0.018-inch and 0.022-inch slot bracket systems?

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Angle Orthod 2019; 89: 605-610

Background: In orthodontics, anchorage is crucial to produce aesthetic, functional and stable occlusal results and several adjuncts can be used to bolster anchorage control, including temporary anchorage devices (TADs), headgear, or biomechanical solutions.

Objectives: To compare maxillary first molar anchorage loss between 0.018-inch and 0.022-inch slot fixed appliance systems.

Materials and methods: Patients requiring bilateral maxillary premolar extractions (N = 74) who were previously enrolled in a randomised clinical trial comparing the effectiveness of 0.018-inch and 0.022-inch slot MBT bracket systems (3M-Unitek, CA, USA) were included. Three-dimensional pretreatment and post-treatment digital models were landmarked and measured (R700 scanner and OrthoAnalyzer software, 3Shape, Copenhagen, Denmark). The anteroposterior position of the first molars was measured using the third medial rugae as a reference point. Anchorage loss (AL) represented the subtraction of the post-treatment distance from the pretreatment distance for both anchorage loss right (ALR) and left (ALL) sides. The values were then compared using a two-way analysis of variance.

Results: There were 41 and 33 cases for the 0.018-inch and 0.022-inch bracket slot systems, respectively. The baseline characteristics were similar between the groups, except for the presence or absence of temporary anchorage devices \((p = .050)\). For the 0.018-inch group ALR was 3.9 mm, while ALL was 3.3 mm; for the 0.022-inch group, ALR was 3.7 mm, and ALL was 3.5 mm, the difference between groups was not significantly different \((p = .970)\). There was also no significant difference between the 0.018-inch and 0.022-inch groups, when subjects with temporary anchorage devices were excluded \((p = .383)\).

Critical appraisal: This study was designed and carried out using participants from a previously reported randomised clinical trial. The study used a large sample size, proper randomisation, allocation concealment, and the investigator was blinded during outcome assessment. The baseline characteristics among the groups were similar. The inclusion and exclusion criteria were well defined. The investigator was calibrated using the software and inter-examiner and intra-examiner reliability was also calculated.

The participants in both groups presented either moderate or severe crowding or increased overjet. However, the severity of crowding was not stratified between the two groups. The authors mentioned this could be equalised due to the randomisation of participant allocation. The treatment protocol was standardised for both appliance systems and the only difference was slot size and arch wires used (standardised wire sequencing was done). The outcome (anchorage loss) was clearly defined and a novel method to assess anchorage loss was used; however, there is a possibility of measurement error as 2D measurements were conducted of 3D objects. The study was also well designed and findings were well outlined. This study was carried out in university clinical settings, which may not be representative of routine work in private practice, and therefore have limited external validity.

Conclusion: This study concluded that bracket slot size did not influence maxillary molar anchorage loss. This emphasises the importance of other biomechanical, and operator-related factors to manage anchorage as treatment progresses.

Reginald Kumar Jnr

Scandcleft Randomized trials of primary surgery for unilateral cleft lip and palate: dental anomalies in 8-year olds


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Introduction: Patients with Unilateral Cleft Lip and Palate (UCLP) are known to have a higher frequency of dental anomalies compared with the general population. Common anomalies include dental agenesis, supernumeraries, atypical anatomy and ectopic eruption.

Objectives: The aim of the study was to examine the prevalence of dental anomalies within the Scandcleft RCT patients with UCLP at eight years of age.

Methods: This study involved a cross-sectional analysis of 425 subjects of Caucasian background.
at a mean age of 8.1 years. Panoramic radiographs taken at the participating centres at eight years of age were collected for the study. Intraoral radiographs or CBCTs were also collected if available. The assessment of these radiographs was performed by four experienced orthodontists at different locations and disagreements were resolved by consensus. The following variables were assessed: tooth agenesis and supernumerary teeth, anomalies of tooth shape and position, ectopic eruption, transposition, and infraocclusion of primary molars. If posterior agenesis was suspected, later available radiographs were used to provide confirmation.

Results: Agenesis was observed in 52.5% of the UCLP patients, with a higher frequency missing the cleft lateral incisor (43.8%) than the non-cleft lateral incisor (4.5%). In 3.3% of subjects, both lateral incisors were missing. Other commonly missing teeth included the second premolars (17.9%). At least one supernumerary tooth was identified in 16.9% of the subjects, the majority being in the cleft lateral region. The rates of supernumerary teeth occurring elsewhere were low (< 2%). It was found that 44.7% of the subjects had a peg-shaped cleft lateral incisor, 7.5% had a normal cleft lateral incisor and 4% had other malformations. In 64 out of 65 of the subjects with a cleft-lateral supernumerary, a lateral incisor was found on each side of the cleft. It was also noted that 14.6% of subjects showed ectopic eruption of at least one tooth, with maxillary molars being the most affected teeth. Transpositions and infraocclusion of at least one primary molar were each found in 3.4% of subjects.

Critical appraisal: Although the study is indicated as a RCT, it provided a cross-sectional evaluation of the prevalence of various dental anomalies in a sample of cleft palate patients. Therefore, the conclusions only related to the frequency of dental anomalies in a UCLP population and should not be generalised to a normal population. In order to assess this, a case-control or cohort study design would be required. The authors are correct in stating that dental anomalies may not necessarily appear on a radiograph by the age of eight and to minimise this follow-up radiographs were performed. The study was limited to patients of Caucasian background and there is likely to be variation if the same methodology was applied to other populations.

Conclusions: Dental disturbances are a common finding in UCLP patients, and many patients can present with multiple anomalies. It is important that these are diagnosed in a timely fashion and that they are factored into the overall treatment management.

Michael Skilbeck

Fluoride varnish for the prevention of white spot lesions during orthodontic treatment with fixed appliances: a randomized controlled trial

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Introduction: White spot lesions (WSLs) are a frequent side-effect of orthodontic treatment using fixed appliances. They are commonly observed on the labial surfaces of teeth with advanced WSLs having limited improvement following the removal of orthodontic brackets resulting in a jeopardised final aesthetic outcome.

Objectives: To conduct an investigation of the application of a novel fluoride varnish formula, containing 1.5% ammonium fluoride (equivalent to 7700 ppm fluoride) as the main ingredient in the prevention of WSL in a group of adolescents undergoing fixed orthodontic treatment.

Method: The study was a randomised, triple blind placebo-controlled design with two parallel arms involving 166 healthy adolescents (12–18 years) undergoing direct bonded fixed maxillary appliances during a period of at least 12 months. All subjects enrolled resided in communities with low natural fluoride content in reticulated water (<0.3ppm). The two parallel groups either had a commercially available fluoride varnish, Fluor Protector S (Ivoclar Vivadent AG, Schaan, Liechtenstein) or placebo varnish, which were identical in flavour and composition except for the ammonium fluoride (1.5%), thus taste, colour and handling properties were the same, and applied every six weeks following mechanical biofilm removal at wire adjustment appointments. The varnishes were left to dry for one minute, and subjects were instructed not to eat or drink for 60 minutes following the application. The primary outcome of the investigation was the incidence and severity of WSLs on the labial surfaces of the maxillary incisors, canines and premolars following orthodontic
treatment, as assessed from high-resolution pre- and post-treatment digital photographs, according to the four-step index score: 1 = no white spot formation; 2 = slight white spot formation (thin rim); 3 = excessive white spot formation (thicker bands); 4 = white spot formation with cavitation.

**Results:** The prevalence of WSLs after treatment was similar in the test group (41.8%) and the placebo group (43.8%). However, the number of patients with more advanced lesions (scores 3 and 4) differed significantly between the two groups, with fewer patients (12%) in the test group having advanced lesions at debond compared to placebo group (26%).

**Critical appraisal:** The strength of the study was that patients, clinicians and investigators were blinded to the allocation of intervention. However, a limitation of the trial with the use of a four-step index was that relying on visual acuity to determine the prevalence and severity of WSL development is subjective. This could have been overcome with a more quantitative measure (e.g., computerised image analysis, light induced fluorescence, electrical caries monitor). Other limitations were: 1) the lack of a standardised set of instructions for oral hygiene; 2) no attempt to assess compliance with oral hygiene; 3) no information of dietary intake; all of which may affect the development of WSLs. The method of mechanical removal of the biofilm was not defined nor measured before applying the varnish, and following varnish application, the groups were instructed not to consume food or liquids; however, this was not enforced. Therefore, a lack of standardisation across the participants/groups may result in differing levels of risk and resultant outcomes.

**Conclusion:** In considering these limitations, the study found the use of regular applications of professionally applied fluoride can alleviate the severity of WSLs but not totally prevent the development of lesions in patients undergoing orthodontic treatment with fixed appliances.

**Teddy Nguyen**

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**Dental arch changes comparison between expander with differential opening and fan-type expander: a randomized controlled trial**

**Massaro C, Janson G, Miranda F, Castillo AA-D, Pugliese F, Lauris JR-P, Garib D**


**Background:** Maxillary constriction and posterior crossbites are common conditions in paediatric orthodontic patients. In certain situations, a greater constriction in the anterior region of the maxillary dental arch may be identified with expansion preferred more anteriorly and minimal effects desired in the molar region. In this scenario, a fan type expander (FE) or an expander with differential opening (EDO) may be considered.

**Objective:** To compare the frequency of posterior crossbite correction and dentoalveolar changes in the maxilla and mandible of the EDO and the FE in the mixed dentition.

**Method:** This two-arm parallel randomised control trial was conducted in a single centre and consisted of 48 patients (aged 7–11 years). The patients were allocated to either the EDO group (24 patients) or the FE group (24 patients) using 1:1 allocation and block randomisation. The patients were instructed to activate the expander two-quarter turns in the morning and evening for 10 days. Total expansion was 4.8 mm in the posterior screw and 8 mm in the anterior screw. The expander was then kept in place for six months as a retainer and then removed. Digital dental models were acquired before treatment and six months after rapid maxillary expansion to assess the outcomes. The primary outcomes investigated were crossbite correction rate and maxillary arch width changes. Secondary outcomes were the consideration of interincisal diastema, arch perimeter, length, size and shape and mandibular dental arch changes.

**Results:** The correction of crossbites was achieved in 100% of patients in the EDO group and 75% in the FE group. A greater increase in the maxillary inter-second deciduous (mean difference of 1.4 mm) and inter-first permanent molars (mean difference of 2.7 mm) distances ($p < 0.001$) was identified in the EDO group, while the FE demonstrated greater increases in the intercanine distance ($p = 0.008$). The differential expansion between anterior and posterior
regions of the maxillary dental arch was significantly greater in the FE group. Changes in maxillary incisal diastema width, arch length and perimeter were similar in both groups. Both expanders changed the maxillary arch shape. The post-treatment arch shape was larger in the anterior region for FE and in the posterior region in the EDO group.

Critical appraisal: The study was easy to follow with clear methodology. The generalisability of the results is limited to non-cleft patients in the mixed dentition and to patients receiving treatment with an FE or EDO using the same protocol. Block randomisation and allocation concealment was completed. The main limitation of the study is that double blinding was not possible since the patient and operator were aware of the expander being used. However, blinding of outcome assessment was achieved. Assessment of primary and secondary outcomes were performed by one observer and re-evaluated after a 30-day interval. Intra-rater error was assessed, identifying excellent reproducibility. The difference in correction of a posterior crossbite between the EDO and FE can be attributed to appliance design as the 25% of the failed correction in the FE group was due to the restriction in expansion in the posterior region due to the posterior hinge. An additional limitation was the short observation period of six months. A longer follow-up period to assess the effectiveness of both the FE and EDO on posterior crossbite correction would be beneficial.

Conclusion: Distinct changes to the maxillary arch width and shape were identified between the FE and EDO. Greater transverse increases of the anterior and posterior regions were observed for the FE and the EDO, respectively. A slightly greater mandibular spontaneous expansion was observed for the EDO only at the molar region. It is recommended that the EDO appliance should be preferred over the FE when posterior crossbite extends to the second deciduous and/or permanent molars.

Margie Paterson

Direct-to-consumer orthodontics: surveying the user experience

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Introduction: Direct-to-consumer (DTC) aligners have seen a recent rapid onset across mainstream global media in the past two years. To date, very little is known about this form of treatment, its possible adverse effects, and patient experience and satisfaction with treatment.

Objectives: To understand users’ experiences with DTC aligners.

Materials and methods: A cross-sectional 24-item online survey was completed by users of DTC aligners. The survey questioned how participants heard about DTC aligners, the primary reasons for obtaining aligners, the interactions with a dental professional prior to purchasing aligners, past experience with orthodontic treatment, satisfaction with DTC aligner treatment, adverse effects, communication with the company, attitudes towards aligners and sociodemographic information. Users were recruited over a six-month period on social media platforms (Instagram, Twitter, Facebook). A recruitment message was posted in five Facebook groups related to DTC aligners and potential participants were also contacted via Instagram and Twitter. A total of 470 responses were analysed.

Results: The majority of respondents were Caucasian females (23–38 years). There were fewer respondents in the lower (≤$24,000) and higher (≥$150,000) income brackets of the US population. The highest percentage of respondents held a Bachelor’s degree (33.8%) and the lowest percentage of respondents held a Professional (2.1%) or Doctoral (2.8%) degree. Over half of the respondents consulted with a dental professional prior to purchasing their aligners, where most were recommended professional treatment. However, over 90% of respondents chose DTC aligners due to convenience and the lower cost. The majority of respondents were satisfied with their treatment and most would recommend DTC treatment to others. Interestingly, despite this, a large proportion of respondents stated that they would have preferred aligner treatment from a dentist or orthodontist.

Critical appraisal: This is a novel study attempting to understand users’ experiences with DTC aligners. Cost and convenience appear to be the two main
reasons respondents chose DTC aligners instead of treatment by a registered dental professional, and the majority were happy with the results. However, the study has several limitations. Most respondents had not yet completed their course of aligners, the overall satisfaction with treatment was not evaluated, and it is likely that a sample of individuals who finally complete treatment may yield different satisfaction results. The authors also stated that consumers who received a refund were required to sign a non-disclosure agreement (NDA). This would have positively skewed the satisfaction levels, as users who signed a NDA may have declined to participate in the study. It was difficult to validate whether users purchased DTC aligners and the overall response rate was not reported.

Conclusions: Despite just under half of the respondents preferring to undertake treatment with a dentist or orthodontist, this study highlights the two main reasons for obtaining DTC aligners, those being cost and convenience. The authors indicate that “it is likely that some form of DTC orthodontics is here to stay”, suggesting that dental professionals consider new ways of co-existing to provide more affordable aligner treatment with flexible payment plans and a reduced number of in-office visits or even offering professional oversight of DTC treatments.

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