

ARTICLES FROM CURRENT ORTHODONTIC LITERATURE SELECTED AND REVIEWED BY: RESIDENTS, GEORGIA SCHOOL OF ORTHODONTICS, ATLANTA, GEORGIA

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Comparison of upper airway measurement

Wun E, Tzu Y. Comparison of upper airway measurement by lateral cephalogram in upright position and CBCT in supine position. J Dent Sci 2019;14:185-91.

Obststructive sleep apnea (OSA) syndrome is a form of sleep-disordered breathing that is characterized by repetitive episodes of partial or complete upper airway obstruction that induces sleep fragmentation and other physical symptoms. This study evaluated the difference in upper airway measurements taken with the patients in different positions, using a lateral cephalogram for the patient in the upright position and a cone-beam computed tomography (CBCT) scan for the patient in the supine position. A sample of 94 adult subjects who had upright cephalograms and supine CBCT images taken as part of an orthodontic diagnostic work-up were retrospectively chosen. Nine male and 12 female patients, aged 15-37 years (mean, 21.2) were chosen using the inclusion criteria of older than 15 years, no subjective symptoms suggestive of OSA, and lateral cephalograms taken in upright position or CBCT taken in supine position with either of these images taken within the last 2 months. Images were taken in centric occlusion using a natural head position. Two measurements were marked and measured on the images: minimum of pharyngeal airway space and the mandibular plane-to-hyoid bone (MP-H). The minimum of pharyngeal airway space was the most constricted A-P distance

of the upper airway from the posterior to the anterior wall of the pharynx. The MP-H was the linear distance perpendicular from the most upper anterior point of the hyoid bone to the mandibular plane. All measurements were taken by 1 investigator. The minimum of pharyngeal airway space was shown to be larger with the patient in the upright position, but the difference was not significant. However, the MP-H was significantly different in the upright versus supine position, with the larger measurement when the patient is in the upright position. The authors concluded that the A-P distance of the most constricted area in the pharynx and the distance of the MP-H could be influenced by a change in body position with downstream implications in breathing, heart, and overall health. One way this study could have been improved would be by incorporating 2 or more calibrated evaluators and statistical evaluation of interexaminer and intraexaminer reliability.

Reviewed by Nick Samuelson

MRI as a method of evaluation

Streva AM, Nahas-Scocate ACR, Castro-Lopes SL, Costa ALF. MRI as a method of evaluation and predicting mandibular growth based on temporomandibular joint. Pediatr Dent J 2019;29:97-104.

Magnetic resonance imaging (MRI) is routinely used in the evaluation of soft and hard temporomandibular joint (TMJ) pathology. The primary hypothesis tested in this article dealt with the predictive value of TMJ MRI images relative to mandibular growth timing and the introduction of orthodontic treatment. The authors reviewed several studies to assess how MRI and the development of the TMJs can contribute to orthodontic diagnosis in growing patients. The study population consisted of children aged 9-16 years. Two MRI scans were carried out: an initial scan and a follow-up scan 2-3 years later to evaluate changes in the mandibular condyle and TMJ integrity. In the initial scan in growing children, the authors identified a condylar growth change or *double contour*. The double contour increased in the condyle of children under 13 years old and virtually disappeared around 16 years of age. Also, the change in the double contour structure was close or coincident with the eruption of maxillary second molars. Although double contour was observable in growing subjects, the authors noted that the

loss of this double contour structure could be interpreted as the end point of growth and bone maturity. This review provided an excellent analysis of the growth and development of TMJ. The authors concluded that MRI is an essential complementary examination for assessment of growth and development of TMJ and can be used to help determine when orthodontic therapy may be the most efficient and successful. Also, the authors state that the additional growth and development information provided justifies the cost of the scans for orthodontic purposes. Further studies are needed to evaluate the accuracy and reliability of MRI in mandibular growth prediction as it relates to orthodontic treatment.

Reviewed by Daniel W. Cho

Appliance treatment of temporomandibular joint

Kyburz KS, Eliades T, Papageorgiou SN. What effect does functional appliance treatment have on the temporomandibular joint? A systematic review with meta-analysis. *Prog Orthod* 2019;20:32.

The primary aim of this systematic review was to assess the effects of removable and fixed functional appliance treatment on the TMJ morphology of Class II adolescent patients; the primary outcome measure was skeletal condylar growth compared with untreated patients. A literature search was conducted by authors, with a third author resolving any conflicts; 318 records were filtered to 11 articles, 8 of which were unique. Treatment outcome of the included studies was measured with MRI, computed tomography, or CBCT before and after treatment; follow-up time was 6-18 months. Bias was assessed using the risk of bias in non-randomized studies of interventions and the Cochrane tool. Bias was concluded to be high for 1 randomized controlled trial and unclear for the remaining 2 articles. The nonrandomized studies also had a risk of bias because of confounding variables, selection bias, performance bias, and detection bias. According to the evidence reviewed, functional appliance treatment is associated with positional and skeletal alterations of the TMJ in the short term compared with untreated control. These changes are anterior and inferior repositioning of the condyle, vertical

displacement of the glenoid fossa, and increased condylar growth. A limited number of articles, non-randomized studies, and small sample sizes were limitations candidly acknowledged. Although the quality of the evidence included is low, this systematic review is an excellent example of well controlled evidence-based orthodontic literature review using multiple investigators, appropriate metrics to evaluate bias, and quantitative pooling.

Reviewed by Ross Savage

Effects of deproteinization on bond strength

Bayrak S, Tuloglu N, Tunc ES. Effects of deproteinization on bond strength of composite to primary teeth affected by amelogenesis. *Pediatr Dent* 2019;41:304-08.

Amelogenesis imperfecta (AI) is a hereditary dental anomaly that affects the enamel of both primary and permanent teeth. The purpose of this study was to evaluate the effect of different dentin deproteinization treatments on the microtensile bond strength (μ TBS) of composite resin to primary dentin affected by hypocalcified AI. Nine hypocalcified primary molars were obtained from 2 AI-affected patients who were members of the same family. Nine comparable sound primary molar teeth were obtained from children with AI unaffected dentition. All teeth were polished with pumice to remove any surface debris and kept in a 0.1 percent thymol solution at 25°C before use. Flat dentin surfaces were obtained from both samples. They were randomly allocated into 3 groups based on deproteinization surface treatment: sodium hypochlorite, chlorine dioxide, and nontreated controls. The μ TBS of specimens were measured with a universal testing machine, and data were analyzed using a one-way analysis of variance and Tukey's tests. The highest mean μ TBS value was found in the chlorine dioxide group of sound primary teeth (24.41 ± 1.08 MPa) and the lowest in the control group of hypocalcified AI-affected teeth (12.20 ± 1.35 MPa). A primary conclusion is that chlorine dioxide solution results in enhanced dentin bond strength and should be the preferred agent for deproteinization following acid conditioning. One limitation of the current study was the small sample size.

Reviewed by Jyoti Sharma

Maxillomandibular surgery and pharyngeal airway volume

Niskanen I, Kurimo J, Janstedt J, Himanen S, Helminen M, and Peltomäki T. Effect of maxillomandibular advancement surgery on pharyngeal airway volume and polysomnography data in obstructive sleep apnea patients. J Oral Maxillofac Surg 2019;77:1695-1702.

OSA is a sleep-related breathing disorder in which there is a partial or total collapse of the pharyngeal airway during sleep. All suspected sleep disorders must be thoroughly evaluated and diagnosed by a physician through polysomnography testing. Continuous positive airway pressure is considered the gold standard for the treatment of patients with mild to severe OSA. Maxillary and mandibular advancement (MMA) surgery may be indicated for patients who do not tolerate continuous positive airway pressure. Some articles suggest MMA surgery is curative for OSA in 65%-100% of cases. This retrospective study included 20 patients with OSA (1 woman, 19 men) with a mean age of 48 years (range, 31-59 years). All patients were treated with MMA and preoperative and postoperative orthodontics. Pretreatment and posttreatment CBCT scans were used to measure upper airway volume. Polysomnography data were used to examine the apnea-hypopnea index and oxygen desaturation index. Epworth Sleepiness Scale score, General Health Questionnaire score, and amount of MMA were also collected. Mean ($\pm$ standard deviation) maxillary and mandibular advancement were 4.6 ± 1.9 mm and 9.3 ± 1.7 mm, respectively. A statistically relevant increase (mean, 64.1%) in airway volume was reported. Oxygen desaturation index-3 or -4 and apnea-hypopnea index values showed statistically relevant improvements after surgery. Epworth Sleepiness Scale scores showed improvement (lower scores) after surgery for most patients ($n = 15$). The study concluded that MMA increases upper airway volume and lowers OSA symptoms according to polysomnography data. Although there was an intraexaminer evaluation, confidence in the results of the study could be compromised because of the use of a single examiner for all analyses.

Reviewed by Jared Stasi

Retainers from conventional stone and 3D printed models

Tahir NM, Hasaan WN, Saub R. Comparing retainers constructed on conventional stone models and on 3D printed models: a randomized crossover clinical study. Eur J Orthod 2019;370-80.

With the advent of 3D printers being used to fabricate retainers, it is important to ensure that the accuracy of appliances fabricated on 3D printed models is similar to conventionally fabricated appliances. This randomized controlled clinical study investigated the effects of fabricating vacuum-formed thermoplastic retainers (VFR) on stone models compared with 3D printed models and how patient perception and stability were affected. Upon debond, 30 participants were given a noninterventional VFR, and after 1 week (T1), they were randomly assigned to receive either a vacuum-formed retainer formed on a model printed by a fused deposition modeling machine (VFR-3D), or a conventional vacuum-formed retainer formed on a stone model (VFR-CV). After 3 months, each group received the other appliance. The dependent variable, oral health-related quality of life was measured using the Oral Health Impact Profile. Postorthodontic dental stability was measured using Little's Irregularity Index. Patients were asked to rate their compliance on a global rating scale. Outcomes were assessed at 1 week (T1), 3 months (T2), and 6 months (T3) after debond. There was no significant difference between the quality of life impact between the 2 groups from T2-T3 after controlling for confounding variables. There was also no significant difference between the 2 groups in Little's Irregularity Index. Compliance decreased over time with a significant difference in compliance being noted from T2-T3 ($P < 0.05$), but between the groups, there was no significant difference. The strengths of the study included the crossover style of the study where each patient served as their control, while limitations of the study involved the lack of double blinding. The authors reported that VFRs formed from 3D printed models are an appropriate alternative to conventionally fabricated VFRs when comparing quality of life and stability.

Reviewed by Bridgette Jones Brooks