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# Literature

## reviews

These literature reviews have been prepared by the postgraduate students of the University of Adelaide, Adelaide, Australia.

### Changes in posterior airway space and hyoid bone position after surgical mandibular advancement

Riepponen A, Myllykangas R, Savolainen J, Kilpeläinen P, Kellokoski J and Pahkala R

*Acta Odontologica Scandinavica* 2017; 75: 73-8

**Introduction:** It is commonly believed that mandibular advancement changes the posterior airway space (PAS) and hyoid bone position with suggestions that this may have a beneficial effect in the treatment of obstructive sleep apnoea (OSA).

The aim of this study was to evaluate the long-term changes in posterior airway space and in hyoid bone distance to the mandibular plane one to three years after mandibular advancement by BSSO. The hypothesis was that the advancement surgery increases sagittal PAS dimension and causes superior movement of the hyoid bone.

**Materials and methods:** The sample consisted of lateral cephalograms of 36 females and 16 males with an average age of 37 years who underwent a BSSO advancement. An assessment was undertaken of PAS sagittal dimension (posterior pharyngeal wall to the posterior most curvature of the tongue) and hyoid bone (Hb) distance to the mandibular plane (MP).

**Discussion:** The present findings were:

- A narrow PAS at the baseline benefitted most but half had postoperatively narrower PAS compared with the preoperative value.
- The amount of mandibular advancement was not related to the change in PAS dimension. The study's weakness is that lateral cephalograms were used, which are a 2D representation of a 3D structure, and 3D imaging now is in common use. The actual shape of the PAS is an ellipsoid cylinder which adapts post-surgically in both the

AP and transverse dimensions but 2D imaging is still justifiable as correlations between 2D and 3D are relatively strong.

- The more the SNB angle increased the more the hyoid bone moved towards the mandibular plane but in a quarter of the subjects studied, the hyoid bone moved away from the mandibular plane. This inferior movement tendency seemed to be related to an increase in PAS dimension, indicating that there is an adverse relationship between PAS and the hyoid bone.
- Altogether, the findings of unpredictable surgery outcomes both in PAS and in the position of hyoid bone are parallel with previous studies.
- PAS increase was shown to relapse over time.
- PAS seemed to increase up to 6 mm of advancement after which no further increase in PAS was seen with a greater advancement of the mandible.
- As stated by Proffit, cephalometric changes of 2 mm or more are of clinical importance and hence, in this study, 62% of change in hyoid bone distance and 62% change in PAS are clinically relevant

The hypothesis concerning the increase in PAS with BSSO should be partially rejected; however, the study confirms the hyoid bone moves superiorly.

In conclusion, males, patients with narrow PAS at the baseline, and those whose mandible moved in the counterclockwise direction with moderate advancement gained more retrolingual airway sagittal dimension by BSSO. However, BSSO alone to increase retrolingual airway space is questionable, because of the minimal clinically significant dimensional advantageous changes in airway patency and the contradictory sagittal outcomes of over 6 mm advancements.

*Critique:* An interesting paper but there were notable points of contention. An evaluation of a 3D structure with lateral films is questionable, especially when the anterior reference is the posterior demarcation of the tongue, which is a temporally postural representation in a non-supine position. It is also suggested that the correlation of 2D to 3D is strong but this only holds when considering a linear measurement; when discussing the effect on the airway, a 3D ellipsoid cylinder, any change in a linear direction will effect a conformational change, reciprocally, in other dimensions and hence the volume seems a far more accurate representation of the practical effect. However, OSA is realistically a dynamically mediated breathing disorder and any measurement in static isolation is hard to draw confident conclusions from.

It was mentioned that in 25% of the patients the hyoid bone moved away from the mandibular plane and it was suggested that there is a direct association with an increase in PAS, but this result seems tenuous, as it is contradictory. This group is the minority of their sample, and the paper stated that the study confirms that the hyoid moves superiorly, and as their significance was based on the 2 mm as suggested by Proffit, it only seems applicable to hard tissue bony surgical segment movements rather than a soft tissue cylinder or a bone suspended by a complex 3D muscular framework.

**Prashanthan Sooriakumaran**

### **The predictability of transverse changes with Invisalign**

**Houle JP, Piedade L, Todescan R Jr and Pinheiro FH**

*The Angle Orthodontist 2017; 87: 19-24*

*Introduction:* The Invisalign appliance utilises a series of custom fabricated sequential polyurethane aligners to provide 0.15–0.25 mm of tooth movement per aligner. The series of plastic aligners are capable of correcting various malocclusions, including posterior crossbites. The amount of clinical arch expansion may not correspond to the predicted amount of expansion evident on the ClinCheck software. Verifying the true amount of dentoalveolar expansion may reduce the need for midcourse refinements and, subsequently, improve treatment efficiency. Therefore, this study aims to compare ClinCheck transverse measurements with the actual clinical outcomes.

*Materials and methods:* Based on a sample size calculation, pretreatment, predicted treatment (ClinCheck plan) and post-treatment stereolithography files were collected of 41 women and 23 men (mean age of 31.2). A single clinician treated all patients using Invisalign only with fortnightly aligner changes and no refinements. Twenty of these patients presented with dentoalveolar crossbites involving at least one tooth.

Transverse linear measurements of cusp tip to cusp tip and the most lingual point at the gingival margin of the canines, premolars and molars, was obtained from the stereolithography files using Geomagic Qualify (Geomagic, Morristown, NC) software. Data were analysed using a paired *t*-test.

*Results:* In the upper arch, a statistically significant difference was observed between the final and predicted transverse expansion ( $p < 0.05$ ). The mean predicted accuracy for cusp tip – cusp tip ranged from 76.6%–88.9%, with the most reliable measurement reported across the canines. In regards to the gingival transverse measurements, the mean predicted accuracy ranged from 52.9% across the molars, to 67.8% across the canines. The accuracy of bodily expansion appears to be less predictable compared to dental tipping, particularly across the posterior region.

Similarly, in the lower arch, a statistically significant difference was reported between the ClinCheck plan and the final clinical outcome. The mean predicted accuracy for cusp tip – cusp tip ranged from 96.9% across the first premolars to 100% across the canines and molars. The amount of expansion across the canine tip and molar, however, showed no statistical difference ( $p > 0.05$ ). The accuracy of bodily expansion was not as high. The mean predicted accuracy for the lower arch ranged from 61% across the canines to 88.4% across the first premolars.

*Conclusion:* Based on the results, Invisalign clinically provides more dental tipping rather than bodily transverse movement. The predicted outcome (ClinCheck) accurately measures 72.8% of maxillary transverse expansion and 87.7% of mandibular expansion. The predicted posterior expansion is less accurate than the anterior region. Therefore, overcorrection and other supporting methods may decrease the need of midcourse corrections and refinements.

**William Luong**

### **The effect of headgear on upper third molars: a retrospective longitudinal study**

**Miclotte A, Grommen B, Lauwereins S, Cadenas de Llano-Pérula M, Alqerban A, Verdonck A, Fieuws S, Jacobs R and Willems G**

*European Journal of Orthodontics* 2017, Feb 4. doi:10.1093/ejo/cjw090.

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**Background:** The main cause of upper third molar impaction is the lack of retromolar space, which is reliant on maxillary tuberosity growth, alveolar bone growth and mesial drift of the upper first molars. The headgear appliance has been used to apply orthopaedic forces to the maxilla, for the correction of skeletal Class II malocclusions in growing patients, but little research has been conducted on the effect of headgear therapy on the space available for the upper third molars.

**Objective:** The objective of the study was to investigate the effects of orthodontic non-extraction treatment with or without headgear on the position of, and the space available for, upper third molars in growing children with Class II malocclusions.

**Methods:** Pre- and post-treatment lateral cephalograms and panoramic films were evaluated of 294 growing children with Class II malocclusions being treated with fixed appliances in combination with functional appliances, Class II elastics or headgear. The subjects were split into a headgear and non-headgear group. Space available for the upper third molars was measured as the distance from PTV to the distal surface of the upper first molar parallel to the occlusal plane (PTV-M1) on the lateral cephalograms. On the panoramic films, the vertical position and angulation of the upper third molars was assessed, and their mineralisation status scored.

**Results:** In the headgear group, the percentage of patients with an increase in PTV-M1 was lower, and there was a decrease in PTV-M1 by 0.96 mm post-treatment; while in the non-headgear group, there was almost no difference in PTV-M1 before and after treatment. Between both groups, there were no significant findings in comparing change in vertical position and angulation.

**Discussion:** Results suggest that in growing patients, the increase in retromolar space is smaller in patients treated with headgear than without. Previous studies by Ricketts and Mirtani demonstrated that the

maxillary first molars moved backwards in relation to the pterygomaxillary fissure with Class II malocclusion patients treated with headgear.

**Critique:** The confounding variable of function of the headgear being used, whether to distalise molars or restrict maxillary growth, was not mentioned in the study. Radiographic references such as of the occlusal plane can be variable and affect measurements. However, it is appreciated that the authors acknowledged limitations such as the use of two-dimensional radiographs, distortions and magnifications of films, restriction of follow up time and an inability to evaluate pure headgear effects.

**Celine Chan**

### **Comparing stability of mandibular setback versus 2-jaw surgery in Class III patients with minimal presurgical orthodontics**

**Larson BE, Lee NK, Jang MJ, Yun PY, Kim JW and Kim YK**

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2391(17)30105-2. doi: 10.1016/j.joms.2017.01.020. *Epub ahead of print*

**Introduction:** Orthognathic surgery aims to restore function and soft tissue balance through the surgical correction of a skeletal discrepancy. The severity of the jaw discrepancy dictates the type of surgery by either involving 1-jaw surgery (mandibular setback or maxillary advancement) or 2-jaw surgery (2J – bimaxillary surgery).

The conventional surgical-orthodontic approach involves a pre-orthodontic phase, orthognathic surgery, and post-surgical orthodontic phase, leading to longer treatment times with deterioration of facial aesthetic and jaw function. The 'surgery first' approach (with minimal presurgical orthodontic decompensation) aimed to produce immediate patient profile satisfaction.

The literature reports on greater forward chin movement after relapse in the surgery-first approach, while some researchers suggest no differences in the amount of skeletal correction/post-surgical relapse and treatment duration. This study aims to evaluate the surgical changes and relapse in the hard tissues and treatment duration in patients with a Class III malocclusion treated by a mandibular setback and minimal presurgical orthodontics or by 2-jaw surgery with minimal presurgical orthodontics and without extractions.

**Materials and methods:** One hundred and ninety-five skeletal Class III patients who underwent orthognathic surgery were enlisted in this retrospective study. Thirty-one patients were selected (mandibular setback, N = 16; 2-Jaw, N = 15). Lateral cephalograms taken before surgery (T0), one month after surgery (T1) and at debanding (T2) were traced by an orthodontist who was blinded to the surgical procedure (amount and direction). Landmark points and reference planes were superimposed at the cranial base between T0-T1 and T2-T1, and horizontal, vertical, angular, and dental measurements were obtained. A Power analysis, paired *t*-test and independent *t*-test were performed and used to assess and compare all groups with significance set at  $p < 0.05$ .

**Results:** The authors found that the bimaxillary surgery group presented a shorter duration of post-surgical orthodontic treatment and total surgical and orthodontic treatment than the mandibular setback group. No significant differences in the amount of surgical change were found between the two groups. No relevant differences were found between the two groups for all horizontal, vertical and angular measurements in the maxilla and mandible. The bimaxillary group showed a significant increase in the angle between the upper incisor and Frankfort horizontal compared with the mandibular setback group.

**Discussion:** The need to improve facial aesthetics in surgical skeletal Class III patients without the need of prolonged pre-surgical treatment times, which results in an unaesthetic appearance and mastication difficulties, gave credence to the 'surgery first' method with minimal pre-surgical orthodontic treatment. Skeletal stability seems to differ according to the type of jaw surgery related to the surgical changes, post-surgical relapse and treatment duration. This retrospective study found that bimaxillary surgery presented a shorter treatment time due to a shorter post-surgical orthodontic need compared with the mandibular setback group. However, no differences in vertical rotation and the amount of relapse were found between the two groups, suggesting a similar amount of mandibular relapse horizontally and vertically, with counterclockwise rotation during post-surgical orthodontic treatment between the two groups. Proffit (2012) reported on the importance of maintaining ramus inclination and limiting the amount of mandibular setback by performing 2-jaw

surgery with maxillary advancement to improve stability.

The upper incisors presented more proclination in relation to Frankfort plane after bimaxillary surgery, possibly due to the alleviation of crowding and a counterclockwise rotation of the maxillary occlusal plane.

The authors reported on study limitations related to the small sample size and gender distribution, and that further studies using a larger homogeneous sample would be ideal to evaluate skeletal stability.

**Conclusions:** Similar anterior and posterior movement and counterclockwise mandibular rotation were found, but 2-jaw surgery presented shorter post-surgical orthodontic and total surgical and orthodontic treatment times than the mandibular setback group.

**Comments:** The paper reported that the same operator traced all cephalograms in a blinded fashion but the presence of the osseous fixation would provide clear evidence of 1-jaw or 2-jaw surgery. Although the authors were diligent in selecting only Class III patients, there is no information on crowding and the exact nature of the skeletal discrepancy, which could have resulted in a highly heterogeneous sample.

**Daniela Ribeiro**

### **Patient's expectations of lingual orthodontic treatment: a qualitative study**

**Hardwick LJ, Sayers MS and Newton JT**

*Journal of Orthodontics* 2017; 44: 1: 21-7

**Introduction:** The determination of a patient's expectations regarding orthodontic treatment helps with patient education, helps to evaluate how treatment might address their concerns and assists in gaining informed consent. There are only a limited number of studies that have investigated a patient's perception of lingual orthodontic treatment.

**Aim:** To investigate patients' expectations in receiving lingual orthodontic treatment

**Sample:** A convenience sample of 15 consecutive patients aged from 16–60 years of age obtained from four primary care orthodontic practices and two secondary care orthodontic hospital clinics.

**Method:** In-depth interviews were performed before the new patient consultation by a single interviewer

in a non-clinical setting for approximately 10–15 minutes. All responses were documented in note or digital form and analysed by using framework analysis.

**Results:** Patients seeking lingual orthodontics had greater knowledge of the appliance and expected lingual orthodontics to have a longer treatment time. Due to increased perceived difficulty in mastication and speech, higher maintenance was expected along with a varying degree of pain and ease of cleaning.

The data noted two simple, single-dimensional typologies: (1) Males, aged under 30 years, undergoing changes in their lives, know that they want hidden braces but are not sure about the specifics; (2) Females, aged 30–45, know they want a hidden appliance and have actively researched what they want.

**Summary:** Patients requesting lingual orthodontics have higher expectations than those seeking labial orthodontics and had done more initial research into this treatment option prior to commencement.

**Critique:** The small sample size of 15 participants was set by 'previous qualitative study of this type' and on the 'basis of sampling strategy' without any further explanation. A power analysis should have been performed. The process of the interview was questionable as there was no mention of whether the interview questions were standardised and whether the researcher was meant to ask the same questions without leading the interviewees. In addition, the emotions, body language, tone and emphasis on words can be highly subjective and based on the interpretation of one researcher only.

As the time of the interview ranged from 10–15 minutes, there could be potential observer bias from the interviewer to get a specific answer. There could also be reporting bias if the information collected in notation form was much shorter and less informative while the digital form could be replayed after the interview to obtain more information.

Finally, the authors did not mention how they derived the above typologies from the results displayed.

**Amy Vei Li Ho**

## **Skeletal and dentoalveolar changes after miniscrew-assisted rapid palatal expansion in young adults: A cone-beam computed tomography study**

**Park JJ, Park Y-C, Lee K-J, Cha J-Y, Tahk JH and Choi YJ**

*The Korean Journal of Orthodontics 2017; 47: 77-86*

**Background:** Rapid palatal expansion (RPE) has been used extensively since the mid-1960s to increase the transverse dimension of the maxilla. However, RPE is only effective when the midpalatal suture can be separated. Until recently, surgically-assisted RPE (SARPE) has been the only effective modality to ensure separation once the midpalatal suture has become unresponsive. In 2010, Lee and colleagues introduced miniscrew-assisted RPE (MARPE) and reported successful expansion of the maxilla through opening of the midpalatal suture.

Skeletal and dentoalveolar changes after conventional tooth-borne RPE have been investigated using cone beam computed tomography (CBCT) in growing patients; however, there is limited information regarding nonsurgical expansion using bone-borne techniques such as MARPE in young adults. CBCT represents an accurate method to assess not only the changes in each tooth and its alveolus, but also the changes in the maxillofacial complex after MARPE.

**Aim:** The aim of this study was to evaluate the skeletal and dentoalveolar changes after MARPE in young adults assessed by CBCT.

**Methods:** This retrospective study included 19 patients, of which 5 were excluded due to failure of opening of the midpalatal suture ( $N = 3$ ), systemic disease ( $N = 1$ ) and previous orthodontic treatment ( $N = 1$ ). The 14 patients included those (mean age, 20.1 years; range, 16–26 years) who had a maxillary transverse deficiency and were treated with MARPE. The MARPE device used was a modified hyrax-type RPE appliance with the addition of four orthodontic miniscrews (1.8 mm diameter and 7 mm length). The skeletal and dentoalveolar changes were evaluated using CBCT images acquired before and after expansion.

**Results:** The midpalatal suture was separated, and the maxilla exhibited statistically significant lateral movement ( $p < 0.05$ ) after MARPE. The pattern of expansion was parallel with transverse increases of 5.5 mm across the molar and 5.4 mm across the

premolar region. The amount of expansion decreased in a superior direction, with values of 3.2, 2.0, and 0.8 mm at the cemento-enamel junction, maxillary basal bone, and zygomatic arch levels, respectively ( $p < 0.05$ ). The buccal bone thickness and height of the alveolar crest decreased by 0.6–1.1 mm and 1.7–2.2 mm, respectively.

**Conclusions:** Successful opening of the midpalatal suture was achieved in 85% of patients, which indicates MARPE can be an effective treatment modality for the correction of maxillary transverse deficiency in young adults.

The pattern of expansion is parallel in nature compared with a fan shaped expansion pattern with conventional RPE, which may be useful in cases in which the maxillary constriction is located more posteriorly.

Even with the addition of four miniscrews, MARPE is not without buccal tipping of the maxillary teeth, which leads to a decrease in buccal alveolar bone thickness and crest height.

The retrospective nature of this study, small sample size, possible selection bias as well as the difficulty in detecting landmarks accurately using CBCT must be considered when interpreting the results and conclusions.

Larger prospective studies are required to validate the conclusions of this study.

**Sven Jensen**

### **Visual perception of faces with unilateral and bilateral cleft lip and palate: An Eye-Tracking Study**

**Dindaroğlu F, Doğan S, Amado S and Doğan E**

*Orthodontics & Craniofacial Research 2017; 20: 44-54*

**Introduction:** Patients with a cleft lip and/or palate (CLP) experience concerns with their facial appearance and function, which result in difficulties in psychosocial adjustment. The main aim of multi-disciplinary treatment of affected patients is to enhance facial aesthetics to improve quality of life and social adaptation. Since orthodontics is an important component of multi-disciplinary treatment, it is essential to understand if there are differences in perceptions between orthodontists, laypersons and individuals with CLP. Eye-tracking is a method that

has gained momentum in the objective analysis of various visual characteristics and viewer perceptions.

**Aim:** The aim of this study was to test the following hypotheses:

- visual perception differs between orthodontists, individuals with CLP and laypersons when viewing faces with unilateral cleft lip and palate (UCLP) and bilateral cleft lip and palate (BCLP);
- faces with UCLP and BCLP are visually perceived differently;
- the hierarchy of visual attention changes when viewing individuals with CLP.

Each hypothesis was tested in faces at rest and faces with a social smile.

**Materials and methods:** Sixty images (faces with a social smile and at rest) of 30 volunteers (unaffected controls, UCLP, BCLP) were viewed by 80 participants (orthodontists, individuals with CLP and laypersons). Eye fixations on four areas of interest were quantified and related to the eyes, nose, upper lip and lower lip–chin. Time to first eye fixation, fixation before, fixation count and fixation duration parameters were also analysed.

**Results:** Faces at rest: The upper-lip area of the control images received fewer fixations than did the UCLP images, and UCLP faces received fewer fixations than BCLP images. In addition, orthodontists fixated more often on the upper-lip area compared with control images and participants with CLP. Laypersons fixated on the eyes for a longer time in all images and made more fixations on all image groups compared with orthodontists and individuals with CLP.

Faces with a social smile: In all participant groups, time to first fixation on the upper-lip area was significantly shorter in images of BCLP and UCLP than in control images. Orthodontists fixated on the upper-lip area for longer than the other participants for both control and images with UCLP and BCLP.

**Critical appraisal:** While the eye-tracking protocol has been validated in the literature, this study's methodology omitted key inclusion/exclusion criteria details between the images viewed, such as the presence of a dental malocclusion. This has the potential to alter the results that were reported, particularly with reference to fixations on the social smile photos. Also, as CLP is commonly associated with developmental malformations and/or syndromes, this is not reflected

in the exclusion criteria either. The age and gender balance among the different observers has not been reported. This has been acknowledged in the discussion, with a suggested need for further studies to analyse eye movements among different age groups and levels of cognitive maturity.

**Conclusion:** The results of this study support the hypothesis that orthodontists and laypersons focussed more attention on the upper lip and the eyes at rest, respectively. Individuals with CLP did not fixate on one of the AOIs more often or for longer than the other participants. Upper-lip area in images with BCLP captured more attention than those with UCLP. The hierarchy of visual attention between the three groups of observers is affected by CLP.

**Sanjana Baksi**

### **Non-surgical treatment of anterior open bite using miniscrew implants with posterior bite plate**

**Abdulnabi Y, Albogha MH, Abuhamed H and Kaddah A**

*Orthodontic Waves* 2017; 76: 40-5

**Introduction:** Temporary anchorage devices (TADs) have recently been used to efficiently treat skeletal anterior open bite (AOB) cases, thereby eliminating the need for surgery or the use of extra-oral appliances. The intrusion of maxillary posterior teeth using TADs results in a forward autorotation of the mandible, a subsequent closure of the AOB and reduction in the lower anterior facial height. Previous studies have reported inconsistent results in regards to the amount of intrusion required of posterior teeth. The availability of reliable information may help determine the magnitude of open bite correction that can be obtained from a certain amount of intrusion.

**Objectives:** To describe the relation between the amount of intrusion achieved using TADs and a posterior bite plate and also the changes in overbite and lower anterior facial height. In addition, muscular activity was assessed before and after treatment to determine the effect of the bite plate on soft tissue function.

**Materials and methods:** The sample consisted of seven males and eight females with an average age of 20.4 years who presented with an average overbite of -3.7 mm (open bite) and an average MPA of 46.9 degrees. Two miniscrew implants (MSIs) were placed in each side of the maxilla. A 3 mm-thick bite plate was

constructed for each patient with two transpalatal bars to control the buccolingual inclination of the posterior teeth during intrusion. The bite plate was cemented to the posterior teeth and coil springs were attached between the MSIs and the bite plate. Cephalometric radiographs taken before and after posterior intrusion were used to measure the upper posterior dental height (UPDH), overbite (OB) and lower anterior facial height (LAFH). Muscular activity using an EMG was recorded before treatment (T1), immediately after placing the biting plate (T2) and after removal of the plate (T3). Comparisons between the muscular signals were made using paired *t*-test.

**Results:** The average intrusion time was 6.3 months. OB after treatment ranged between 0.5 and 3 mm. The average amount of intrusion achieved was 2.9 mm, resulting in average closure of the open bite by 5.2 mm and an average decrease in LAFH of 3.1 mm. The amount of posterior tooth intrusion (UPDH) had meaningful relations with changes in LAFH and OB ( $p < 0.05$ ). A linear regression analysis predicted a 1 mm increase in OB and 0.7 mm decrease in LAFH for each 1 mm intrusion of the posterior teeth. The insertion of the bite plate significantly reduced the activities of the masseter and anterior temporalis muscles during clenching and swallowing

**Critical appraisal:** This was a well-conducted clinical study that was easy to follow. The main limitations of the study were evident in the small sample size, the short-term results and the possible errors associated with the landmark identification using cephalometric radiographs. The statement made by the authors that 'TADs can eliminate the need of surgery' in skeletal open bite cases needs to be carefully evaluated with further research using a larger sample size. Also, several aspects of masticatory function need to be assessed to confirm the improvement of function, if any, after treatment of open bite malocclusions.

**Conclusions:** The short-term results of this study imply that severe open bite cases in adults can be treated with TADs by the intrusion of posterior teeth, and so eliminate the need for surgery. The amount of posterior tooth intrusion is linearly related to the resulting increase of OB and reduction of LAFH. The effect of the bite plate on masticatory muscular activity seems to be temporary and it is unlikely that muscular forces contributed to the intrusion of posterior teeth during treatment.

**Premal Patel**

## **The effect of a lidocaine/prilocaine topical anesthetic on pain and discomfort associated with orthodontic elastomeric separator placement**

**Abu Al-Melh M and Andersson L**

*Progress in Orthodontics 2017; 18: 1*

**Background:** Pain or discomfort during orthodontic treatment can affect a patient's compliance and response to treatment, which may lead to poor outcomes. Previous studies have demonstrated that the discomfort caused by latex separator elastomerics can gradually increase 24 hours after placement.

Topical anaesthetics have been proposed to reduce the discomfort, and include EMLA (2.5% lidocaine/2.5% prilocaine in a creamy eutectic mixture) as well as a thermosetting gel (Oraqix). The advantage of Oraqix is that the gel hardens at intraoral temperature, therefore making it possible to be contained within the gingival crevice. It is also simple to administer and is painless.

**Aim:** The aim of this study was to compare the topical anaesthetic effect of Oraqix (2.5% lidocaine/2.5% prilocaine) gel with Vaseline acting as a placebo on the reduction of pain and discomfort from the initial placement of orthodontic elastomeric separators.

**Methods:** A cohort of 50 undergraduate 5<sup>th</sup> and 6<sup>th</sup> year dental students, staff members and dental assistants from the Faculty of Dentistry, Kuwait University were included in the study. This was composed of 47 females and 3 males. The inclusion criteria meant that subjects had to have healthy gingival tissues with an intact maxillary dentition that had tight unrestored and non-carious contacts. Persons with systematic diseases or taking analgesics were excluded from the study.

A split mouth design was applied in which subjects had elastomeric separators placed in between the 1<sup>st</sup> maxillary molar and premolar on the upper right and left. This was done two minutes following the administration of the Oraqix gel on one side and Vaseline on the other. Oraqix was dispensed around the gingival margins and into crevices using a blunt dispensing needle. It was ensured to be painless and non-invasive. A few drops were also applied to the elastomeric separator prior to placement. On the contralateral side, using an irrigation syringe with a blunt activator tip, a small amount of placebo Vaseline

was placed around the gingival margins of the first molar and second premolar. The subjects were blinded and half received Oraqix on the right side, the other half on the left.

After placement of the separators, subjects were asked to report the degree of pain on a visual analogue scale and a verbal scale. The subjects' responses were recorded every second minute for a total period of 10 minutes. The separators were then removed. A questionnaire was also given and returned the following day which contained questions regarding the overall satisfaction, taste, numbing effect, presence of numbness after 30 minutes, personal preference and recommendation.

**Results:** The discomfort/pain score was found to be significantly lower with the topical anaesthetic group than with the placebo. This was most significant from the sixth minute onwards.

As expected, most subjects preferred the taste from the placebo side

Thirty-five subjects reported slight numbness remaining on the topical anaesthetic side after 30 minutes.

An overall satisfaction with topical anaesthetic over placebo was reported in 87% of the people treated.

**Critical appraisal:** A greater sample size would have been preferable. In addition, other confounding factors such as age, gender and pain threshold should have been considered as these can affect a person's response to orthodontic treatment. The subjects in this study may have been influenced by their dental awareness.

It would have been helpful to see the outcome over a greater period of time after separator placement, as in this experiment they were removed after 10 minutes.

**Conclusions:** Topical anaesthesia in the form of Oraqix could potentially reduce discomfort associated with the initial placement of orthodontic elastomeric separators. This may be especially useful in complex cases where patients may have low pain thresholds.

**Adam Wahab**