How Accurate Are Dental Models Constructed From Cone Beam Scans?

Accuracy Assessment of Three-Dimensional Surface Reconstructions of Teeth From Cone Beam Computed Tomography Scans.

Al-Rawi B, Hassan B, et al:

J Oral Rehabil 2010; 37 (May 1): 352-358

Tooth models extracted from cone beam images are generally within 0.5 mm of actual tooth size, and the shape varies somewhat with overestimation of cusps and grooves due to voxel size.

Background: 3-dimensional (3D) imaging, such as cone beam computed tomography (CBCT), has recently become more widely utilized. While one eventual goal of 3D imaging is to provide a means of replacing traditional dental casts, further research needs to be done in testing the accuracy of these scans when used to produce tooth models.

Objective: To objectively examine the accuracy of tooth models from CBCT scans with different fields of view (FoV).

Design: In vitro scans of dry human jaws.

Methods: 2 dry human jaws were placed in a sealed container and submerged in water (for soft tissue simulation). Scans were performed using the Scanora 3D CBCT scanner (Soredex, Tuusula, Finland) using 3 different FoV: small (6 x 6 cm, 133 µm voxel size); medium (7.5 x 10 cm, 200 µm voxel size); and large (7.5 x 14.5 cm, 250 µm voxel size). MicroCT scans with 35 µm resolution were done on individual extracted teeth to serve as the gold standard. Individual crowns from the CBCT scans were superimposed on the MicroCT crowns to determine the error.

Results: Means errors between CBCT and MicroCT were 120 µm for the small FoV, 157 for the medium FoV, and 207 µm for the large FoV. Statistically significant differences were found between the CBCT scans and the MicroCT scans as well as between the large and medium FoV scans. No significant differences were found between the medium and small FoV. CBCT models always appeared larger than the MicroCT scans.

Conclusions: Error in CBCT scans can be >0.5 mm for some occlusal surfaces. While this would not be acceptable to create most prosthetic appliances, it may provide enough accuracy for diagnosis and treatment planning in orthodontics.

Reviewer's Comments: Reducing or eliminating the need for impressions in the orthodontic office would be nice, especially if usable information could be extracted from a CBCT scan taken for other reasons. The method employed for this study was very time-intensive, but with sufficient accuracy, many of the steps could be automated or done by digital technicians. The relationship between error and FoV is not surprising, and it works against us in orthodontics because we would like to have a large FoV to assess skeletal structures and yet a small FoV provides the best tooth models. (Reviewer-Brent E. Larson, DDS, MS).

© 2010, Oakstone Medical Publishing

Keywords: Cone Beam CT, Accuracy, Dental Models

Print Tag: Refer to original journal article
Class III skeletal patients can accommodate to a large range of dental movements.

**Background:** Patients with Class III skeletal malocclusions are often treated with incorporating dental compensations into the occlusion. What are the limits of these compensations, and will they result in undesirable periodontal sequelae?

**Objective:** To determine the skeletal, dental, and soft tissue changes that occur in response to camouflage Class III treatment.

**Participants:** The sample for this study consisted of 30 patients with an average age of 12.4 years. All had skeletal Class III malocclusions and completed comprehensive nonextraction orthodontic treatment.

**Methods:** Cephalometric radiographs were taken before and after treatment to evaluate skeletal, dental, and soft tissue changes. The peer assessment rating (PAR) index was also recorded, and the level of gingival attachment was measured. These results were compared with an untreated control group of 30 white subjects from the Bolton-Brush Study in Cleveland, Ohio.

**Results:** The average improvement in skeletal change was greater in the treatment group when compared to the control group. There were no significant differences when the level of gingival attachment was measured. There was a wide range in the amount of incisal movement required to compensate for the skeletal relationship, with the upper limit for the maxillary incisors being 120° to the sella-nasion line, and for the mandibular incisors, the lower limit was 80° to the mandibular plane.

**Conclusions:** A wide range of skeletal Class III relationships can be treated with dental compensation without negative effects to the periodontium.

**Reviewer’s Comments:** When I saw the title of this article, I assumed it would be a study of adult Class III skeletal patients. Therefore, I was somewhat surprised to see that the sample consisted of growing patients who were all treated by nonextraction, which is appropriate treatment for growing Class III patients for whom the amount and direction of future growth is unknown. Treating these patients by nonextraction, however, actually limited to some degree the amount of dental Class III compensation that could be incorporated in the treatment plan. It will be interesting to see the long-term follow-up treatment results of this sample of treated growing Class III patients. (Reviewer-John S. Casko, DDS, MS, PhD).

© 2010, Oakstone Medical Publishing

Keywords: Class III Camouflage Tx, Occlusions, Limits

Print Tag: Refer to original journal article
Distraction osteogenesis of the maxilla provides great improvement and reasonable stability for young patients with cleft lip and palate.

**Background:** A common problem in many children with cleft lip and palate is underdevelopment or hypoplasia of the maxilla. Because of scar tissue formation, some of these children have significant anterior crossbites that can be psychosocially disabling. Orthognathic surgery on these young individuals, before growth has been completed, is not advised. However, distraction osteogenesis could be performed. What is the impact and long-term stability of distraction osteogenesis of the maxilla in young cleft lip and palate children?

**Objective:** To perform a follow-up of distraction osteogenesis 5 years postoperatively in patients with cleft lip and palate.

**Design:** Retrospective clinical analysis.

**Participants/Methods:** The sample consisted of 13 consecutive, prepubertal children, around the age of 13 years, who had severe maxillary deficiency. All children had cleft lip and palate deformities. Maxillary distraction osteogenesis was performed on all subjects, and the maxilla was advanced between 11 and 13 mm. Cephalometric radiographs were taken before and after distraction, as well as up to 5 years after the distraction was completed.

**Results:** Immediately after distraction, a significant improvement had occurred. After 1 year and 2 years, approximately 40% of the overjet correction had relapsed due to continued mandibular growth without compensatory maxillary growth. After 5 years, there was significant relapse due to continued disparity in maxillary and mandibular growth, but there was still positive overjet.

**Conclusions:** Although relapse is apparent after distraction osteogenesis in growing children with cleft lip and palate, the psychosocial benefits are certainly worth performing this type of surgical procedure on these growing children.

**Reviewer's Comments:** I have treated many cleft lip and palate children. I agree that it is difficult to treat many of these children with traditional maxillary protraction. Distraction osteogenesis seems like a much better option and can be accomplished in a shorter period of time. I was pleased to learn that after 5 years, the stability was reasonably good, even though some relapse had occurred due to the disparity between maxillary and mandibular growth. (Reviewer-Vincent G. Kokich, Sr, DDS, MSD).

© 2010, Oakstone Medical Publishing

**Keywords:** Distraction Osteogenesis, Cleft Lip & Palate

**Print Tag:** Refer to original journal article
Background: Long-term retention is frequently advocated after orthodontic treatment since many patients will experience at least some minor alignment change over time without retainers. To minimize issues with patient compliance, fixed retainers are often used in the mandibular and maxillary anterior region. However, traditional multistranded stainless steel wires can be unaesthetic and may produce problems in patients with nickel allergies. New materials, such as glass fiber reinforced (GFR) retainers, have been published in case reports, but no long-term, large-scale studies have been done.

Objective: To compare the success rate and periodontal health of GFR retainers with traditional multistranded stainless steel retainers.

Design: Prospective parallel study design.

Participants: 184 patients finishing comprehensive orthodontic treatment in 1 of 3 private practices. Ninety untreated control subjects were recruited from a local high school.

Methods: Patients were sequentially assigned to receive an upper and lower bonded retainer made from either a GFR retainer with 500 unidirectional fibers (GFR500; n=45), a GFR retainer with 1000 unidirectional fibers (GFR100l; n=48), or a multistranded wire group (n=91). At 6, 12, 18, and 24 months, a single calibrated clinician measured the success rate, modified gingival index (MGI), bleeding on probing (BOP), and plaque index (PI) on each patient.

Interventions: The retainer was bonded in a standardized manner for all groups. The lingual surface was cleaned, sandblasted, and etched with 35% phosphoric acid for 30 seconds. A bonding agent (Excite®, Vivadent) was placed and light cured, and then the retainer was fixed with a flowable composite (Tetric flow®, Vivadent) to each tooth.

Results: The GFR retainers had a failure rate of 51% compared to 12% for the multistranded wire group. Additionally, the MGI and BOP were higher in the GFR groups. These changes were statistically significant, but no significant differences were found between the GFR500 and GFR1000 groups. All periodontal indexes showed a statistically significant increase in the fixed retainer groups as compared to the controls.

Conclusions: GFR retainers currently show an unacceptably high failure rate for clinical practice.

Reviewer’s Comments: The high rate of failure seen with the GFR retainers makes them a poor choice for routine use. It is also important to note that many of the GFR failures were breakage of the retainer not just debonding from the tooth. This makes repair more difficult and time-consuming. GFR retainers should probably remain only as a choice for those who cannot accept or tolerate the multistranded wire design. (Reviewer- Brent E. Larson, DDS, MS).
1-Year Stability of Single- vs 3-Piece Maxillary Osteotomy Is Equivocal

Stability of Le Fort I Osteotomy in Bimaxillary Osteotomies: Single-Piece Versus 3-Piece Maxilla.

Kretschmer WB, Baciu G, et al:


The postoperative stability of single-piece and 3-piece maxillary osteotomy is equivocal.

**Background**: Le Fort osteotomy is common for orthognathic surgery patients. In most situations, the maxilla can remain in 1 piece. However, due to occasional transverse problems, in some patients, the maxilla must be divided into 2 or 3 pieces. Is there any difference in the stability 1 year after surgery between a single-piece or 3-piece maxillary osteotomy?

**Objective**: To measure the effect of segmentation on the stability of different maxillary surgical procedures.

**Design/Methods**: This was a retrospective analysis of the records of 120 subjects who had undergone Le Fort I osteotomy. In 60 of these patients, the maxilla remained in 1 piece. In the other 60, the maxilla was divided into 3 pieces during the operation. Cephalometric radiographs taken immediately before surgery, immediately after surgery, and 1 year postoperatively were measured and compared between both groups. The authors evaluated changes in anteroposterior and vertical dimensions.

**Results**: When the authors compared the stability of single-piece and 3-piece maxillary osteotomies, they found no statistically significant differences 1 year after surgery. In addition, the authors found that the amount of change postoperatively was not correlated with the amount of change that occurred during surgery.

**Conclusions**: Both single-piece and 3-piece maxillary osteotomies are similar, or equivocal, with respect to stability 1 year postoperatively.

**Reviewer’s Comments**: This was an interesting study. I was surprised at the results. It seems to me that the postoperative changes would have been less stable in the three-piece maxillary surgery group. However, this was a cephalometric study. I wonder what the authors would have found if they looked at the occlusal relationships of the maxillary and mandibular teeth in these 2 groups. In my experience, 3-piece maxillary procedures typically are required when there is a transverse problem. My question has always been whether or not the transverse relationship that is corrected during surgery is stable long-term. Cephalometric analysis would not uncover the answer to this question. (Reviewer-Vincent G. Kokich, Sr, DDS, MSD).

© 2010, Oakstone Medical Publishing

Keywords: Segmented Maxillary Osteotomy, Le Fort I Osteotomy

Print Tag: Refer to original journal article
Useful information about patient expectations can be gathered during the initial patient visit by using a carefully worded "Smile Questionnaire."

**Background:** The definition of successful orthodontic treatment is relatively ill-defined. Some objective scales, such as the Peer Assessment Rating and the American Board of Orthodontics indices, give guidelines for treatment. However, these scales do not directly evaluate esthetics, which is the reason many patients seek orthodontic care. Understanding a patient's expectations is critical in providing quality treatment.

**Objective:** To describe a method of evaluating chief complaints and expectations using a short questionnaire that can allow a clinician to set realistic expectations and can lead to more favorable final results.

**Design:** Expert opinion.

**Methods:** A short questionnaire is given to patients at the start of treatment. An electronic copy can be found at: http://gnathosce.com/smile-questionnaire.pdf. The questions involve the patient's perception of tooth size, tooth shape, crowding, spacing, protrusion, gingival display, and orthodontic history. Using the responses to these questions, an appropriate treatment plan can be agreed upon that is both realistic orthodontically and acceptable to the patient. This information and the discussion that it prompts can lead to improved informed consent processes with the patient more clearly understanding the possibilities and limitations of the proposed treatment.

**Conclusions:** Incorporating a relatively short questionnaire on patient expectations at the start of treatment can improve esthetic treatment planning and facilitate discussion with patients on realistic goals.

**Reviewer's Comments:** Dr. Samson recently presented this material to my residents at the University of Minnesota, and I was impressed with the simplicity of the questionnaire and yet the important impact it may have upon making treatment decisions with a patient. We tend to make esthetic decisions about patients from our point of view as experts and sometimes forget the ultimate judge of the esthetic outcome is the patient, not us. This simple tool can help focus the discussion on the patient’s expectations and strengthen the informed consent process. (Reviewer-Brent E. Larson, DDS, MS).

© 2010, Oakstone Medical Publishing

Keywords: Aesthetics, Treatment Planning, Informed Consent

Print Tag: Refer to original journal article
For some Medicaid patients, it may be advantageous to elect not to receive interceptive orthodontic treatment.

**Background:** Some Medicaid programs provide support for interceptive orthodontic treatment. Is it necessarily to a patient's advantage to undergo this treatment? This is something that you and your patients should know.

**Objective:** To compare dental outcomes by evaluating several Peer Assessment Rating (PAR) scores after interceptive treatment versus observation.

**Participants:** The sample for this study consisted of 170 Medicaid-eligible children.

**Methods:** Subjects were randomly divided into 2 groups; one of the groups received interceptive orthodontics and the other group underwent observation only. PAR scores were used to evaluate the initial and follow-up models for both groups. The Handicapping Labiolingual Deviation (HLD) index, which is used to qualify patients for Medicaid treatment, was also performed.

**Results:** The patients who underwent interceptive orthodontic treatment had significantly greater decreases in the PAR scores. At the 2-year follow-up, 80% of the patients in the interceptive orthodontic group whose malocclusions initially were deemed medically necessary no longer qualified for comprehensive treatment compared with 6% of the observation group.

**Conclusions:** Medicaid patients can lose their eligibility for comprehensive orthodontic treatment if they receive interceptive orthodontic treatment.

**Reviewer's Comments:** This was a very interesting article. It clearly demonstrated that interceptive treatment can reduce the severity of a malocclusion but not necessarily lead to an acceptable result. It can result in Medicaid paying less to receive a less than desirable result. I wonder how many patients and practitioners are aware of this. This is a good example of a research study that can reach very different conclusions based on how you view the results. (Reviewer: John S. Casko, DDS, MS, PhD).

© 2010, Oakstone Medical Publishing

Keywords: Interceptive Orthodontic Treatment, Effects

Print Tag: Refer to original journal article
Effect of Bracket Slot on Orthodontic Treatment -- Is Smaller Better?

Clinical Outcomes of 0.018-Inch and 0.022-Inch Bracket Slot Using the ABO Objective Grading System.

Detterline DA, Isikbay SC, et al:

Angle Orthod 2010; 80 (May): 528-532

There is no significant difference when comparing clinical outcomes using 0.018-inch and 0.022-inch bracket slots.

Background: As most orthodontists are aware, there are 2 different sizes of bracket slots: 0.018-inch and 0.022-inch. Both sizes of bracket slots are used by significant numbers of orthodontists. Some believe that the smaller bracket slot produces less force on teeth. Others believe that the larger bracket slot provides better control. Is there any difference in the quality of treatment or length of treatment between these 2 sizes of bracket slots?

Objective: To quantitatively compare the clinical outcomes of orthodontic cases treated with either 0.018-inch brackets versus 0.022-inch brackets.

Design/Methods: This was a retrospective analysis of 828 consecutively treated orthodontic cases from the Graduate Orthodontic Clinic at Indiana University. Approximately 25% of the patients had been treated with 0.022-inch brackets, and 75% were treated with 0.018-inch bracket slots. In order to compare the sample initially, the Discrepancy Index from the American Board of Orthodontics was used to measure discrepancy. These cases were similar in their amount of discrepancy. The American Board of Orthodontics Objective Grading System was used to measure the quality of the end result. In addition, the length of treatment was compared between these 2 different sizes of bracket slots.

Results: There was a statistically significant difference in the length of treatments between the 2 groups. Those treated with the 0.018-inch bracket slot, on average, were treated in about 4 months less time than those with the larger bracket slot. In addition, the authors found that the scores on the Objective Grading System were about 2.5 points less, or better, using the 0.018-inch bracket slot than the 0.022-inch brackets. However, the authors pointed out that these differences, although statistically significant, were probably not clinically significant.

Conclusions: There were statistically, but not clinically, significant differences in treatment time and objective grading scores in favor of 0.018-inch brackets compared to 0.022-inch brackets.

Reviewer's Comments: As a former Director on the American Board of Orthodontics, I have had the opportunity to grade many cases at the Board examination. I can tell you that the difference in the average point score between these 2 bracket slot groups was, as the authors mentioned, clinically insignificant. Therefore, I agree with the authors that both bracket slots are similar, or nearly equivocal, in terms of their performance, at least for this sample that was treated at Indiana University. (Reviewer-Vincent G. Kokich, Sr, DDS, MSD).

© 2010, Oakstone Medical Publishing

Keywords: Bracket Slot, Size, Treatment Outcomes

Print Tag: Refer to original journal article
In this randomized clinical trial of maxillary advancement in cleft patients, the stability of advancement 5 years postoperatively was much better in the distraction group than the conventional surgery group.

**Background:** Comprehensive treatment of cleft lip and palate (CLP) patients with maxillary deficiency tends to require a combined orthodontic and orthognathic surgery approach. Classically, this maxillary advancement has been done with a Le Fort I osteotomy, but there are concerns with high relapse rates (25% to 50%) for CLP patients. Distraction osteogenesis (DO) offers an alternate method of advancing the maxilla with the potential for greater long-term stability.

**Objective:** To provide a long-term comparison between DO and conventional orthognathic surgery (CO) in CLP patients.

**Design:** Randomized clinical trial.

**Participants:** 47 CLP patients needing maxillary advancement of 4 to 10 mm based on presurgical model surgery. Patients were randomly allocated to the CO or DO group.

**Methods:** Both groups had presurgical orthodontics to align and decompensate the arches. The CO group had a Le Fort I osteotomy to fully mobilize the maxilla. Two titanium miniplates were used to stabilize the maxilla in its advanced position, as determined by an occlusal wafer set to the desired result. The DO group also had the maxilla fully mobilized, but not advanced to its final position. Instead, after a 3-day latency, 2 internal distractors were used to advance the maxilla to its final position at a rate of 1 mm per day. A lateral cephalograph was taken presurgically and then again postsurgically at 2 weeks, 8 weeks, 3 months, 6 months, and 1, 2, 3, 4, and 5 years. A horizontal and vertical reference system was created by constructing a horizontal line 7 degrees off from the S-N line and then dropping a perpendicular line through the sella. Changes in the horizontal and vertical plane were measured at each time point.

**Results:** Both methods were effective in advancing the maxilla. However, the CO group relapsed upward and backward, while the DO group moved further downward and forward. These differences were statistically significant overall, with the greatest changes occurring in the first year postoperatively. Beyond 2 years postoperatively, there were significant differences in the upper incisor angulation, indicating some dental compensation for the skeletal relapse in the CO group.

**Conclusions:** Advancement of the maxilla in cleft lip and palate patients shows less surgical relapse after distraction compared to a Le Fort I osteotomy.

**Reviewer's Comments:** This is an impressive randomized trial with nearly 50 patients included. The 5-year follow-up is also significant, making the results of great clinical importance. The remaining question is whether these results can be repeated in other places with other surgical teams. If you are involved in cleft treatment, this finding would certainly be worth discussing with your surgical team. (Reviewer-Brent E. Larson, DDS, MS).

© 2010, Oakstone Medical Publishing

**Keywords:** Maxillary Advancement, Distraction Osteogenesis, Le Fort, Stability

**Print Tag:** Refer to original journal article
Scheduling a staff training day can increase the quality and efficiency of your practice.

**Background:** The success of your practice depends to a large degree on the level of professional, communication, and treatment skills possessed by your staff. How do you make sure your staff is performing in a way that maximizes the excellence of your practice?

**Objective:** The purpose of this guest presentation article was to discuss the implementation of an individualized professional development plan for each of your staff members to improve their job skills.

**Discussion:** The goal is to create an ongoing and comprehensive training process that allows the team member to excel and help the practice operate at the highest levels of clinical excellence and operational efficiency while providing high-quality patient care. Developing an individualized professional development program for each of your staff members is no different than the process that occurs in most successful businesses. After the specific needs of each individual staff member are identified, an individualized training program can be implemented and the progress continually reviewed. In addition to improving individual staff skills, a program such as this also improves the attitudes of team members who appreciate the effort to improve their skills. It is also a good idea to regularly schedule a training day that can be aimed at the entire team, a subgroup of employees, or an individual. It also makes sense to bring in outside speakers who have skills that can address the needs of your practice.

**Conclusions:** An individualized professional development program can improve patient care and practice efficiency.

**Reviewer's Comments:** I found the suggestions in this article to be very practical. It is easy to look at programs like this and get the feeling that they involve a lot of extra work on your part. Unfortunately, your staff is unlikely to maximize their clinical and communication skills on their own, and if your staff is not maximizing their skills, your practice is probably suffering. (Reviewer-John S. Casko, DDS, MS, PhD).

© 2010, Oakstone Medical Publishing

Keywords: Developing Staff Potential
When mini-implants are positioned adjacent to or contacting roots, root resorption is highly likely when the mini-implant is loaded.

**Background:** Mini-implants are now a popular source of orthodontic anchorage to assist in difficult tooth movement. In some situations, orthodontists may place their own mini-implants. However, during placement, the mini-implant could inadvertently be positioned in contact with an adjacent tooth root. What happens when this implant is loaded?

**Objective:** To evaluate the histological reaction of the root, periodontal ligament, and bone tissue at various root proximities of a mini-implant.

**Design:** This was an animal experimental study.

**Methods:** A total of 46 mini-implants were placed in 4 experimental animals. These implants were intentionally placed at varying distances from the roots of adjacent teeth, as well as intentionally in contact and perforating roots of teeth. One week after placement, the implants were loaded with a 200-g load. After 16 weeks, the implants were evaluated histologically to determine the incidence of root resorption.

**Results:** In the near-root and periodontal ligament contact groups, the incidence of root resorption increased when the distance between the mini-implant and the root was <0.6 mm. In the root contact group, resorption of the root was typically seen. In the root perforation group, ankylosis and root resorption occurred.

**Conclusions:** Avoiding root contact and reducing bone damage favors a decrease in root resorption and ankylosis of mini-implants.

**Reviewer's Comments:** This was a very good study. Previous articles have suggested that the clinician should remove a mini-implant if, during placement, it comes into contact with an adjacent root. This makes good sense. This study has shown that if the implant remains in contact with the root and is then loaded for 16 weeks, it can cause significant root resorption. Contact with roots of teeth should be avoided during mini-implant placement. (Reviewer-Vincent G. Kokich, Sr, DDS, MSD).

© 2010, Oakstone Medical Publishing

Keywords: Mini-Implants, Orthodontic Loading

Print Tag: Refer to original journal article
Comparing the Use of Invisalign Between Orthodontists and General Practitioners

Comparative Use of Invisalign® by Orthodontists and General Practitioners.
Vicéns J, Russo A:

Angle Orthod 2010; 80 (May): 425-434

Significant differences exist between orthodontists and general practitioners when using the Invisalign appliance.

**Background:** Clear aligners have been used for several years to align teeth in patients with dental malalignment. Both orthodontists and general dentists use these types of appliances. Are there differences between these 2 populations of practitioners when using aligners?

**Objective:** To compare the use of Invisalign between orthodontists and general practitioners.

**Design:** This was a survey of general dentists and orthodontists who use the Invisalign appliance.

**Methods:** A total of 406 questionnaires were mailed, and 160 were returned. The total response rate was 39%. The response rate for orthodontists was 55%, and that of general practitioners was 33%. Twenty-five questions were asked of these 2 groups.

**Results:** There were differences between orthodontists and general dentists regarding the use of the Invisalign appliance. Orthodontists and general practitioners, who have been certified in Invisalign longer, have also started and completed more cases than those who had been certified for less time. Generally, orthodontists have started and completed more Invisalign cases than have general practitioners; however, over the 12 months before the survey was conducted, general practitioners started more Invisalign cases than were started by orthodontists. For both groups, the longer practitioners were certified in Invisalign, the fewer cases they started over the 12 months before the survey.

**Conclusions:** Significant differences exist between the perception and use of the Invisalign appliance by orthodontists and general dentists.

**Reviewer's Comments:** As time goes on, more and more general practitioners are using the Invisalign appliance. With time and more experience, I believe general dentists will eventually realize that only certain types of malocclusions are amenable to being treated with the Invisalign appliance. However, this recognition does take some time and experience in using the appliance. (Reviewer-Vincent G. Kokich, Sr, DDS, MSD).

© 2010, Oakstone Medical Publishing

Keywords: Invisalign, Orthodontists, General Practitioners

Print Tag: Refer to original journal article
Lingual fixed appliances induce gingival inflammation in the short term.

**Background:** Fixed lingual bracket systems are used by many orthodontists to camouflage or hide orthodontic appliances. However, these brackets are often placed near the gingival margin on the lingual surfaces of the anterior teeth. Does lingual bracket positioning have any effect on gingival health?

**Objective:** To analyze the short-term influence of fixed lingual appliances on the periodontal status in humans.

**Design/Participants:** This was a clinical evaluation of 20 patients between the ages of 12 and 36 years. Participants were selected consecutively from patients who were treated in the Department of Orthodontics of the Hannover Medical School.

**Methods:** A full periodontal examination was performed before placement of brackets. Probing pocket depth, bleeding upon probing, and plaque index were evaluated. Customized lingual brackets were placed on the mandibular teeth of all subjects. The subjects were instructed in oral hygiene measures, were informed to brush their teeth at least twice a day, and were instructed to use interdental toothbrushes. After 4 weeks, all periodontal parameters were again measured to determine the impact of the brackets on gingival health. A sample of subjects without lingual brackets was used as a control, and the labial areas of teeth were also used as a control.

**Results:** On the lingual aspects of the teeth that were bonded with brackets, there was a significant increase in bleeding upon probing after 4 weeks. However, there was no significant change or increase in probing pocket depth.

**Conclusions:** The insertion of fixed lingual appliances induces an increase of plaque accumulation, resulting in gingival inflammation in the short term. These changes were restricted to the bonding sites.

**Reviewer's Comments:** It would be interesting to note whether the long-term effects on oral hygiene would result in deepening of the probing pocket depths in these cases. I hope these authors continue to follow their sample long term to determine if there are any irreversible changes that occur in hygiene and periodontal status. (Reviewer-Vincent G. Kokich, Sr, DDS, MSD).

© 2010, Oakstone Medical Publishing

Keywords: Lingual Brackets, Periodontal Status

Print Tag: Refer to original journal article
Maxillary Distraction in Cleft Palate -- What Are Long-Term Effects?

Skeletal and Dental Stability After Maxillary Distraction With a Rigid External Device in Adult Cleft Lip and Palate Patients.

Aksu M, Saglam-Aydinatay B, et al:

J Oral Maxillofac Surg 2010; 68 (February): 254-259

Maxillary distraction is a viable procedure for correcting maxillary hypoplasia in adult cleft lip and palate subjects.

**Background:** Although most cleft lip and palate patients are treated as children, occasionally adults present to the orthodontist with maxillary hypoplasia, secondary to cleft lip and palate. Maxillary osteotomy with forward positioning of the maxilla is an option in these subjects. Another option is distraction osteogenesis in adults. What is the long-term outcome of maxillary distraction in a sample of adult subjects with cleft palate?

**Objective:** To evaluate the skeletal and dental changes with distraction osteogenesis of the maxilla in an adult cleft lip and palate population.

**Design/Methods:** This was a retrospective evaluation of lateral cephalometric radiographs of 7 adults who had undergone distraction of the maxilla. The average age before distraction was 21 years. Follow-up cephalometric radiographs were available an average of 3 years after the procedure.

**Results:** During the initial distraction, maxillary length increased, on average, 9 mm during the distraction. In addition, the palatal plane increased as the maxilla moved in a counterclockwise rotation. During the post-distraction period, the maxilla relapsed 20%. The effective maxillary length decreased by 2 mm. The palatal plane angle returned to its original position with clockwise rotation.

**Conclusions:** Significant maxillary advancement can be achieved with counterclockwise rotation of the maxilla, and during the 3 years after distraction, only 20% relapse occurred with the maxilla rotating clockwise to its original position.

**Reviewer’s Comments:** I have never attempted distraction osteogenesis in an adult; however, this seems like a logical procedure. The only problem is that, in order to accomplish the distraction, an adult must wear some sort of metal halo that is attached to the head as anchorage for the distraction. This could be inconvenient for some adults. The other option is to simply undergo maxillary Le Fort osteotomy. I was interested in the findings that the relapse was only 20% for a 9 mm advancement. This amount of relapse seems relatively minor for these types of adult cases. (Reviewer-Vincent G. Kokich, Sr, DDS, MSD).

© 2010, Oakstone Medical Publishing

Keywords: Maxillary Distraction, Cleft Lip & Palate

Print Tag: Refer to original journal article
Nasal Function May Be Impaired After UCLP Treatment

Objective Assessment of the Nasal Airway in Unilateral Cleft Lip and Palate—A Long-Term Study.

Mani M, Morén S, et al:

Cleft Palate Craniofac J 2010; 47 (May): 217-224

Nasal impairment is measurable in unilateral cleft lip and palate subjects on the affected side long term.

Background: Unilateral cleft lip and palate (UCLP) is associated with deformity of the midface, often requiring multiple surgical treatments to help correct both form and function. However, despite the improvement surgery provides, clinical problems can still remain, especially with the function and appearance of the nose. Long-term data using objective measures of nasal function after surgery have not been previously described in the literature.

Objective: To compare long-term nasal function after 1-stage and 2-stage palatal closure for UCLP.

Design: Retrospective review.

Participants: 83 patients who were treated for a complete UCLP between 1960 and 1987 at Uppsala University Hospital in Sweden were included. The mean time after primary surgical treatment was 32 years. A total of 128 consecutive records were found for this time period, but some patients had associated syndromes, were living abroad, or failed to respond to the invitation to participate.

Methods: Patients treated from 1960 to 1977 were treated with a 1-stage palatal closure surgery. For this surgery, the palate was elongated and closed by shifting mucoperiosteal flaps medially and posteriorly. This left exposed bone that healed by secondary intention. After 1977, the soft palate was closed at around 6 months of age, and then a second surgery to close the hard palate was performed at 2 years of age. Nasal volume and cross-sectional area were objectively measured with acoustic rhinometry, using reflected sound. Airflow and pressure during respiration were measured using rhinomanometry to calculate resistance to airflow. Finally, odor identification was assessed using the Scandinavian Odor Identification Test (SOIT).

Results: The nasal function on the cleft side was found to be impaired compared to both the unaffected side and to age-matched controls. This impairment consisted of a significantly smaller volume and cross-sectional area, as well as higher resistance at inspiration and expiration. On the cleft side, there were no significant differences between the 2 surgical techniques, but the 1-stage surgery showed a significantly larger nasal volume on the non-cleft side. The SOIT score was significant lower in the UCLP patients compared to controls, but only the 2-stage surgery showed a significant change when analyzed separately.

Conclusions: UCLP subjects show long-term impairments in nasal function after palatal closure surgery. No significant differences were found between a 1-stage and 2-stage surgery on the cleft side.

Reviewer's Comments: One of the challenges when comparing treatment strategies for cleft conditions is that the outcome is not known for many years. In this case, the average patient was examined 32 years after palate repair surgery. These results underscore the continued challenges for cleft patients long after reconstructive surgery—in this case, the restriction of nasal airflow through the cleft side of the nose whether a 1- or 2-stage palatal closure was used. (Reviewer-Brent E. Larson, DDS, MS).

© 2010, Oakstone Medical Publishing

Keywords: Cleft Lip & Palate, Nasal Function

Print Tag: Refer to original journal article
The systematic approach to assessment and planning presented in this article leads to improved orthognathic surgery outcomes.

**Background:** Planning a combined orthodontic and orthognathic surgery treatment for a patient with skeletal disharmony can be a complicated process. Occlusion, facial esthetics, and airway considerations need to be included in the treatment planning process.

**Objective:** To describe a 3-step process to reliably plan combined orthodontic and orthognathic surgery treatment. These 3 steps are orthodontic preparation, facial examination, and esthetic cephalometric treatment planning.

**Design:** Expert opinion.

**Methods:** During the orthodontic preparation stage, the dental arches should be decompensated so the incisors are placed ideally in the skeletal base. The authors recommend mandibular incisors be placed 61° to 68° to the mandibular occlusal plane, and maxillary incisors 54° to 60° from the maxillary occlusal plane. Also, consider surgical expansion of the maxilla if needed, rather than orthodontic expansion. Orthodontic expansion can have a higher relapse and cause excessive buccal flaring, leading to an unpredictable surgical result in the nasal base width if it is fixed surgically. During the facial examination stage, the authors promote direct clinical examination, as photographs and radiographs may not accurately portray certain features. Examination should be done with the patient in a natural head position, centric relation, and relaxed lip position. Placing a mirror underneath the upper lip to examine different amounts of lip support can be informative. Finally, cephalometric treatment planning is done in 7 sub-steps: maxillary incisor angulation, mandibular incisor angulation, overbite correction, overjet correction, esthetic anteroposterior and vertical maxillary incisor positioning, occlusal plane manipulation, and chin osteotomy. Following these steps provides a predictable method for planning the surgery.

**Conclusions:** Having an organized approach when planning combined orthodontic and orthognathic surgery cases is important for predictable outcomes. This simple 3-step process reliably produces good facial esthetics and occlusion.

**Reviewer's Comments:** This article communicates the thought process of a leading oral surgeon when assessing a possible orthognathic case. It is interesting to note that incisor positioning is done almost exclusively to the occlusal plane, so occlusal plane positioning is critical to the esthetic outcome. (Reviewer-Brent E. Larson, DDS, MS).

© 2010, Oakstone Medical Publishing

Keywords: Treatment Planning, Orthognathic Surgery

Print Tag: Refer to original journal article
In this animal study using rabbits, tooth movement using 60-g force levels resulted in approximately 20% more movement than when using 20 g of force.

**Background:** Despite many research studies in both animals and humans, there is still conflicting evidence on how the magnitude of force affects the rate of tooth movement. Different studies have concluded that heavier forces move teeth faster, that lighter forces move teeth faster, or that there is no difference. None of these previous studies examined the result of different forces on daily tooth movement.

**Objective:** To examine the effect of different force magnitudes on daily tooth movement in rabbits.

**Design:** Randomized, prospective study in an animal model involving female New Zealand rabbits (n=25; mean age, 14 weeks).

**Methods:** A notch was made through the incisal edge of both maxillary incisors of each rabbit. A helical torsion spring made from either 0.012” stainless steel or 0.014” stainless steel was used to open the space between the incisors. These springs produced either a force of 20 ± 3 g (0.012”) or 60 ± 5 g (0.014”). Every morning, the distance between the incisors was measured with digital calipers.

**Results:** After 20 days of movement, the mean distance between incisors was 3.98 ± 0.59 mm in the 20-g group and 4.82 ± 0.82 mm in the 60 g-group. The 60-g group showed significantly greater movement the first 3 days and the final 6 days. However, from day 4 to day 14, movement slowed in both groups and was not significantly different. Both groups showed tipping movement.

**Conclusions:** Higher forces showed a slight increase in tipping tooth movement in rabbits over a 20-day period.

**Reviewer’s Comments:** I have difficulty deciding how these animal studies may be applicable to humans. This study showed that a 3-times increase in force had a very minor impact on the rate of tooth movement. One limitation is that the movement was an uncontrolled tipping movement that involves a wide range of pressures in the PDL. The tooth movement in this case was also across the palatal suture and, although no sutural opening was evident radiographically, it is possible that the higher force levels induce some sutural change, adding to the measured tooth movement. We still have much to learn in this area to guide us in clinical decision making. (Reviewer-Brent E. Larson, DDS, MS).

© 2010, Oakstone Medical Publishing

Keywords: Tooth Movement, Force Levels

Print Tag: Refer to original journal article
Break-even analysis is a basic economic concept that can be applied to orthodontic practices.

**Background:** Most orthodontists feel an obligation to provide orthodontic care for some Medicaid patients who cannot otherwise afford it. How many Medicaid patients could you take into your practice without it having a negative financial impact on the practice?

**Objective:** To examine, under a specific set of practice assumptions, the simulated effect on profitability of treating patients covered by Medicaid in orthodontic practices in North Carolina.

**Participants:** The sample for this study consisted of 154 orthodontists in active practice in North Carolina in 2005, 58% of whom returned questionnaires.

**Methods:** Questionnaires were sent to each of the participating orthodontists related to the type of practice they had and the number of Medicaid patients they treated. Participants were subdivided into 4 groups based on the number of Medicaid cases they started, ranging from 0 in group 1 to ≥13 in group 4. Based on the data provided in the questionnaires, a break-even analysis was performed.

**Results:** The average number of Medicaid starts was as follows: 0 in group 1; 3 in group 2; 9 in group 3; and 30 in group 4. Ninety-seven percent of the respondents indicated a potential to increase the number of patients that could be treated by their current staff and facility. The break-even analysis indicated that the inclusion of 5% of patients enrolled in Medicaid in the active patient pool had a minimal effect on the financial break-even point and was unlikely to have a negative financial impact on the practice.

**Conclusions:** Most orthodontists could have 5% of their patients enrolled in Medicaid and not suffer financially.

**Reviewer's Comments:** It has been my experience that most orthodontists suffer a dilemma when trying to decide whether to treat Medicaid patients. On one side, they would like to help needy patients; on the other side, the financial remuneration and likelihood of poor cooperation increase reluctance to treat these patients. It is nice to know that if you decide to treat a small number of Medicaid patients in your practice, it is unlikely to have a negative financial impact on the practice. (Reviewer-John S. Casko, DDS, MS, PhD).

© 2010, Oakstone Medical Publishing

Keywords: Medicaid Patients, Treatment Costs

Print Tag: Refer to original journal article
Bite Wafers Provide Nonpharmacologic Alternative to Reduce Orthodontic Pain

Treatment of Pain After Initial Archwire Placement: A Noninferiority Randomized Clinical Trial Comparing Over-the-Counter Analgesics and Bite-Wafer Use.

Murdock S, Phillips C, et al:

Am J Orthod Dentofacial Orthop 2010; 137 (March): 316-323

Over-the-counter analgesics are no more effective than bite wafers for reducing orthodontic pain after initial archwire insertion.

Background: It is common for orthodontic patients to exhibit pain after initial archwire insertion. Is there a nonpharmacologic alternative to over-the-counter (OTC) medications to reduce this pain?
Objective: To evaluate the relative effectiveness of OTC medications versus a bite wafer to reduce orthodontic pain after initial archwire placement.
Participants: The sample for this study consisted of 49 patients who were undergoing orthodontic archwire placement.
Methods: The patients were subdivided into 2 groups; one group used OTC medication to control pain, and the other used a bite wafer. The subjects completed questionnaires to rate their pain intensity and the quality of their pain at 8 times during a 7-day period.
Results: The patterns of pain level, intensity, and unpleasantness over time were similar for the 2 groups. OTC medication was no more effective than using a bite wafer to control pain.
Conclusions: The use of a bite wafer provides a nonpharmacologic alternative to OTC medication to control orthodontic pain after initial archwire insertion.

Reviewer’s Comments: I was not familiar with the use of bite wafers to control dental pain. Although most patients do not have a problem using OTC medications, a small number do have a problem, and it is nice to know that there is a nonpharmacologic alternative. Most patients in this study used the bite wafer for <20 minutes a day. It was interesting to note that pain in both groups increased after 2 hours and peaked at bedtime of day 1, which is similar to results found in other studies related to the placement of separators. (Reviewer- John S. Casko, DDS, MS, PhD).

© 2010, Oakstone Medical Publishing

Keywords: Over-the-Counter Analgesics, Bite-Wafers, Orthodontic Pain

Print Tag: Refer to original journal article
Orthodontic patients should use whatever type of toothbrush they prefer.

**Background:** It is not uncommon to find subgingival plaque formation on molars that have orthodontic bands on them. Is there one type of toothbrush that is more effective than another in reducing this plaque? Knowing the answer to this question can help you better advise your patients.

**Objective:** To evaluate the comparable effectiveness of 3 different types of toothbrushes in reducing subgingival plaque.

**Participants:** The sample for this study consisted of 21 patients wearing fixed orthodontic appliances.

**Methods:** The subjects were subdivided into 3 different groups. Each group used an ultrasonic, electric, and manual toothbrush for 30 days followed by 14 days when they returned to the toothbrush and dental floss usage according to the instructions from their orthodontist. Each of the 3 groups used the ultrasonic, electric, and manual toothbrushes in a different order. The subjects were evaluated for plaque accumulation on the banded molars at baseline and at the end of the 30-day trial with each toothbrush.

**Results:** All 21 patients completed the study with no adverse affects reported by any of them. When used 3 times daily for 2 minutes, no toothbrush demonstrated superiority on microbiologic parameters on banded molars of adolescent orthodontic patients.

**Conclusions:** Ultrasonic, electric, and manual toothbrushes were equally effective in reducing subgingival calculus on molars with orthodontic bands.

**Reviewer’s Comments:** This was a very practical study. I am often asked by patients about the best type of toothbrush to use with orthodontic brackets. I tell them that the type of toothbrush is much less important than the amount of time spent brushing. After seeing the results of this study, I feel much more confident in my advice. (Reviewer-John S. Casko, DDS, MS, PhD).

© 2010, Oakstone Medical Publishing

Keywords: Toothbrushes, Effectiveness

Print Tag: Refer to original journal article