An Evidence-Based Review of 4 Controversial Topics

Evidence-Based Review of 4 Controversial Topics.
Anthony Gianelly, DMD, PhD, MD
-Guest Presentation; 79 (May): 422-427

Extraction treatment is not a risk factor for temporomandibular disorder.

Evidence concerning (1) the relationship of extraction treatment and development of temporomandibular disorder (TMD), (2) the value of 2-stage treatment when compared to later 1-stage treatment, (3) the effect of orthodontic treatment of smiles and profiles, and (4) rapid maxillary expansion (RME)-induced spontaneous correction of Class II molar relations is reviewed. Is extraction treatment a risk factor for development of TMD? Is there any added value in 2-stage treatment? Does extraction treatment harm the esthetics of the smile and facial profile? Does RME in patients with Class II malocclusions routinely result in the spontaneous correction of Class II molar relations? Available data indicate that (1) extraction treatment is not associated with development of TMD, (2) there is no added value to 2-stage treatment except for the occurrence of less root resorption that exceeds 2 mm in subjects treated in 2 stages, (3) smiles after extraction treatment are as esthetically pleasing as smiles after non-extraction treatment and posttreatment profiles of extraction and non-extraction patients, for the most part, are similar, and (4) routine correction of Class II molar relations after RME does not occur.

Conclusions: Extraction treatment is not a risk factor for TMD. There is little added value to 2-stage treatment except for the possibility of less root resorption exceeding 2 mm. Disadvantages are longer treatment time and the possible need for retention between stage 1 and 2. Extraction treatment does not compromise facial esthetics. RME in patients with Class II malocclusions does not routinely lead to conversion of Class II molar relationships to Class I relationships. This review is an abstract of an audio presentation from Practical Reviews in Orthodontics. If you do not have access to this presentation and would like to purchase a copy, please call 1-800-633-4743, email service@oakstonepub.com, or write Oakstone Medical Publishing, 100 Corporate Parkway, Suite 600, Birmingham, Alabama 35242.
Tx Outcomes for Managing Maxillary, Mandibular Impacted Second Molars

Impaction and Retention of Second Molars: Diagnosis, Treatment and Outcome: A Retrospective Follow-Up Study.
Magnusson C, Kjellberg H:
Angle Orthod; 79 (May): 422-427

The most successful management of impacted second molars is surgical uncovering and orthodontic treatment.

**Background:** Occasionally, orthodontists are challenged to treat a patient with either a maxillary or mandibular impacted second molar. Options for treating these situations vary from surgical uncovering, to orthodontic treatment, to extraction of the second molar. What types of treatment outcomes can one expect?

**Objective:** To describe both the outcome of treatment in patients with second molar impaction and the outcome of no treatment.

**Design/Participants:** Retrospective analysis of 87 subjects, evenly divided between males and females, with a mean age of 15 years who had 135 impacted or retained second molars.

**Methods:** Some of these molars were impacted (defined as having an obstacle in the path of eruption of that tooth), and some had primary retention of the second molar (defined as impaction without an obstacle to eruption). A small number of second molars were defined as secondary retention, which occurs after a tooth has begun eruption through the gingiva but then stops erupting. The authors then went back into the records to determine what treatment was performed and outcomes of that specific treatment.

**Results:** 20% of second molars were left untreated. Of these that were not treated, 44% erupted into good occlusion. When the authors evaluated those teeth that were actually impacted with an impediment to their path of eruption, they found that 91% of these teeth were treated. The most common treatment was surgical exposure and orthodontic eruption. The authors found that surgical exposure was the most successful treatment, with a success rate of about 70%; however, the authors found that of those second molars that did receive surgical uncovering and treatment, only 42% achieved successful results. Finally, the authors found some individuals in the sample who had the second molar extracted so that the third molar could move mesially and take its place. Unfortunately, this resulted in a success rate of 11%.

**Conclusions:** The best treatment for an impacted second molar is surgical uncovering and orthodontic treatment.

**Reviewer’s Comments:** This was an interesting study. The sample reported on in the study was very large. I believe that most orthodontists would have predicted the outcome. If surgery is used to uncover the impacted second molar, and orthodontic treatment is rendered, this would produce a higher rate of success than simply uncovering the tooth. What I thought was interesting was the fact that only 11% of those cases treated by extraction of second molars with replacement by the third molar were actually successful.
Self-Etching Primers Provide Less Resistance to Decalcification

Effects of Sealant and Self-Etching Primer on Enamel Decalcifications. Part II: An In-Vivo Study.

Ghiz MA, Ngan P, et al:
Am J Orthod Dentofacial Orthop; 135 (February): 206-213

Self-etching primers provide less resistance to decalcification than do conventional etch and sealant systems.

Background: Self-etching primers have the advantage of saving chair time and the disadvantage of omission of the sealant layer that might make the etched enamel vulnerable to enamel decalcification. Does this really happen?

Objective: To compare the effects of a conventional etch and sealant with those of a self-etching primer on enamel decalcification in vivo.

Participants: 25 patients who were in the permanent dentition and scheduled to receive comprehensive orthodontic treatment.

Methods: Plaque scores were recorded pretreatment and throughout treatment to determine oral hygiene compliance. A split-mouth research design was used to allow each patient to serve as his or her own control. Each patient was randomly assigned to have the conventional etch and sealant used on one arch and the self-etching primer on the other. At the completion of orthodontic treatment, decalcification scores were determined for each tooth.

Results: Significantly higher decalcification scores were found in the self-etching primer group when compared to the conventional etch and sealant group. The self-etching primer group had nearly double the number of affected teeth when compared to the conventional etched sealant group. These differences were even greater in the poor oral hygiene groups. There was no difference in the amount of decalcification when maxillary arch was compared to the mandibular arch.

Conclusions: Conventional etch and sealant systems should be used if patients have a history of fair or poor oral hygiene.

Reviewer's Comments: I found the results of this study to be very interesting. I was not aware that the omission of the sealant layer with self-etching primers could have a significant effect on enamel decalcification. I believe this was a well-designed research study, which clearly indicates that, for patients with fair or poor oral hygiene, it is appropriate to use a conventional etch and sealant system when bonding brackets.

Additional Keywords: Enamel Decalcification

print tag: Refer to original journal article.
Does Histomorphometric Research Support Early Loading of Mini-Screw Implants?


Luzi C, Verna C, Melsen B:

Eur J Orthod; 31 (February): 21-29

This animal research provides histomorphometric evidence that immediate loading of mini-screw implants does not negatively impact the bone healing process around the implant.

**Background:** Although clinical experience appears to support early loading of mini-screw implants, little scientific information is available that examines the actual bony response to immediate loading.

**Objective:** To examine the bone healing around mini-screw implants that are loaded immediately after placement.

**Design:** Prospective study using adult monkeys to allow histomorphometric analysis.

**Methods:** 4 adult monkeys had a total of 50 mini-screw implants placed. The mini-screws were all placed with the monkeys under general anesthesia. A 2-mm deep pilot hole was drilled, and then screws were manually placed at 45 degrees. Placement of the screws was timed to allow observation of 1 week, 1 month, 2 months, and 3 months prior to animal sacrifice. Most mini-screws were loaded with springs immediately after placement, but 8 screws (2 in each monkey) were left unloaded as controls. After sacrifice, tissue blocks surrounding the screws were sectioned, and the sections were examined histomorphometrically to determine bone volume, bone in contact with the implant, and areas of bone mineralization and resorption.

**Results:** 4 screws were lost during the experiment due to instability. The bone volume was quite variable and didn't appear to vary whether or not screws were loaded. The bone in contact with the implant tended to decrease in the first month and then increase. The mineralization and resorption showed opposite trends.

**Conclusions:** Overall, immediate loading of mini-screw implants did not seem to affect the bone healing pattern.

**Reviewer's Comments:** There was significant variability in the response just within these 4 monkeys, indicating that it may be difficult to predict the exact bone response in any one individual. This individual variability is almost certainly true in humans as well. Based on these results, it seems reasonable to load mini-screw implants early without fear of disturbing the bone healing response.

**Additional Keywords:** Mini-Screws

**print tag:** () Refer to original journal article.
Computer-Based Superimpositions Are as Accurate as Hand-Traced Ones

Comparison of Hand-Traced and Computer-Based Cephalometric Superimpositions.
Huja SS, Grubaugh EL, et al: 
*Angle Orthod;* 79 (May): 428-435

Computer-based superimpositions of pretreatment and posttreatment cephalometric radiographs are as accurate as hand-traced superimpositions.

**Background:** For years, most orthodontists hand-traced their pretreatment and posttreatment cephalometric radiographs and then superimposed these radiographs on specific cephalometric landmarks to ascertain changes that occurred during orthodontic treatment. With the development of computer-based systems to interpret and archive office information, software has now been developed to provide computer-based cephalometric superimpositions for practitioners. But, are these computer-generated superimpositions as accurate as the hand-traced system?

**Objective:** To determine the ability of an operator to produce comparable superimpositions using digital and hand methods.

**Design/Methods:** Experimental design that involved the analysis of 64 pairs of pretreatment and posttreatment cephalometric radiographs. Subjects were 31 female and 33 male participants. Average ages ranged from 12.9 years pretreatment to 15.6 years posttreatment. First of all, these radiographic pairs were traced by hand and superimposed by hand using specific cephalometric landmarks. The outcome was recorded. Then, these same pairs of radiographs were analyzed using computer software and were superimposed using computer-based software. The superimpositions were compared to determine any differences.

**Results:** No statistically significant differences for the reproducibility of hand and digital methods existed, and the superimposition methods for both hand-traced and computer-based techniques were similar.

**Conclusions:** Computer software designed to create pretreatment and posttreatment cephalometric superimpositions appears to be accurate and acceptable for interpretation of orthodontic treatment when compared to hand-traced and superimposed techniques.

**Reviewer’s Comments:** Personally, I still trace my own cephalometric radiographs and superimpose them. It is something I have always done, and I believe that my accuracy is as good as can possibly be achieved. However, I recognize that if one can identify the same landmarks that one traces on the cephalometric radiographs, then a software program can be written to superimpose 2 radiographs in order to ascertain the same information as can be found on hand tracings. So, I was pleased to see that this study confirmed that computer-based cephalometric superimpositions are accurate.

**print tag:** () Refer to original journal article.
Presence of Cleft Does Not Influence Prevalence of Periodontal Disease

Are Teeth Close to the Cleft More Susceptible to Periodontal Disease?

de Almeida ALPF, Gonzalez MKS, et al:
Cleft Palate Craniofac J; 46 (March): 161-165

In this study of 400 patients, periodontal disease as measured by probing depth or attachment level was not more common in the area of the cleft compared to other areas of the mouth.

**Background:** It is unknown whether teeth in the cleft area are more susceptible to periodontal disease than teeth in other areas of the mouth.

**Objective:** To determine whether periodontal disease is more frequently seen in the cleft area compared to other areas of the mouth.

**Design:** Cross-sectional clinical study of patients presenting for cleft lip and palate treatment.

**Participants:** 400 subjects, both male and female, with a cleft lip and palate deformity. Age range was from 15 to 49 years.

**Methods:** All patients with clefts who met inclusion criteria were invited to participate. Enrolled subjects were clinically examined by calibrated examiners for 4 periodontal parameters: (1) pocket depth, (2) attachment levels, (3) bleeding upon probing, and (4) plaque. The type of cleft was recorded, as well as patients’ ages. Correlation analysis was done to find associations between presence of periodontal disease and the cleft area.

**Results:** Presence of plaque and gingival bleeding was very high in all areas of the mouth. Presence of periodontal disease as indicated by probing depths and attachment levels was low. The area of the cleft was not associated with increased periodontal disease, but age was an identified factor influencing presence of periodontal disease.

**Conclusions:** Presence of a cleft did not increase the prevalence of periodontal disease, but rather presence of disease was much the same as in non-cleft populations.

**Reviewer's Comments:** Periodontal disease in this cleft population did not act any differently than in the population in general. There were high levels of bleeding and plaque but low levels of periodontal disease. In fact, cleft areas did not have higher levels of bleeding or plaque than did other areas of the mouth.

**Additional Keywords:** Periodontal Disease

**print tag:** () Refer to original journal article.
EMG Muscle Activity Does Not Determine Facial Type

Electromyographic Activity of Masseter and Temporal Muscles With Different Facial Types.
Vianna-Lara MS, Caria PHF, et al:
Angle Orthod; 79 (May): 515-520

Masticatory muscle activity has no association with different facial types.

**Background:** It seems intuitive to orthodontists that muscle activity participates in developing facial form. With that theory, individuals with long faces or dolicofacial types would have weaker muscle activity, whereas those with brachyfacial types would have stronger or greater muscle activity. But, is that perception true?

**Objective:** To determine the electromyographic (EMG) activity of the masseter muscle and the anterior portion of the temporalis muscle in individuals with different vertical facial types.

**Design/Methods:** Descriptive evaluation that measured EMG activity in 79 subjects with different facial types: brachyfacial, mesofacial, and dolicofacial. These distinctions were determined by making cephalometric analyses of each subject and grouping them according to their specific cephalometric facial relationships. Then, both resting EMG activity as well as isometric and isotonic muscle activity were measured for the masseter and anterior portion of the temporalis muscles. These recordings were then compared among the 3 facial types.

**Results:** At rest, those individuals with brachyfacial types had lower EMG activity in the masseter and temporalis muscles compared to subjects with mesofacial and dolicofacial types. This difference was statistically significant. However, with all isometric and isotonic evaluations of the muscles in maximum contraction, there were no differences in EMG activity of the masseter and anterior portion of the temporalis muscle among the 3 facial types.

**Conclusions:** Different vertical facial types do not have different EMG activity of their masticatory muscles.

**Reviewer's Comments:** This was a very good study; however, the sample size was relatively small. However, with that said, the authors have found the same conclusion that previous well-done studies with larger samples have found: EMG activity of muscles does not determine the facial type among humans. This is good information for orthodontists who may assume that muscle activity is a determinant of facial form.

**Additional Keywords:** Facial Type

**print tag:** () Refer to original journal article.
Mandibular Distraction Osteogenesis Can Resolve Significant Crowding in the Arch

Advancement of Mandibular Symphysis With Distraction Osteogenesis.
Turk T, Cakmak F, Sumer M:
Am J Orthod Dentofacial Orthop; 135 (February): 232-240

Advancement of the mandibular symphysis with distraction osteogenesis can resolve severe crowding and provide a potential alternative to mandibular advancement surgery for some patients.

Background: Patients with a well-aligned maxillary arch, significant crowding in the mandibular arch, and a retrusive chin are often treated with mandibular first premolar extraction and surgical mandibular advancement. Are there any other alternatives for treating this type of patient?

Design: Case report article.

Objective: To describe the treatment of a 22-year-old male patient who had a large nose, a well-aligned maxillary arch, a mandibular arch with significant crowding, excessive overjet, and a retrusive chin.

Case Discussion: As an alternative to extraction of 4 first premolars, which would have increased the patient's obtuse nasolabial angle, added emphasis to his large nose, and not resolved the profile problem with the patient's retrusive chin, the authors elected to treat this patient with advancement of the mandibular symphysis using distraction osteogenesis. This procedure involved the advancement of the mandibular 6 anterior teeth and the entire mandibular symphysis, which created enough space distal to the canines to resolve the significant crowding problem, eliminated the excessive overjet, and advanced the retrusive chin. The posttreatment records demonstrated excellent occlusal and profile results at the time of debanding. The procedure presented in this article involved corticotomy cuts between the canines and first premolars, which included the lower border of the mandible. An intraoral distraction device was used to advance the entire symphysis including the mandibular 6 anterior teeth. This procedure was clearly capable of resolving significant crowding in the mandibular arch while at the same time advancing the retrusive chin. While this is a somewhat unusual way to treat this type of problem, it was very successful, and the patient records presented in this article clearly demonstrate use of the technique.

Conclusions: Advancement of the mandibular symphysis with distraction osteogenesis can resolve significant crowding in the mandibular arch and advance the chin without extraction.

Reviewer's Comments: The most likely alternative treatment for the patient described in this article would be the extraction of 2 mandibular first premolars, retraction of the mandibular incisors, and surgical mandibular advancement. I believe this treatment alternative would have provided equally successful occlusal and profile improvements. If you are faced with the treatment of the patient described in this article, which treatment alternative would you choose? I suspect this would, to a great extent, depend on the experience of the oral and maxillofacial surgeon with whom you work. I also think it would be interesting to see the long-term results of the patient treated in this article.

Additional Keywords: Distraction Osteogenesis

print tag: (Refer to original journal article.)
# A New Possibility for Timing Class III Surgery?

"Surgery First" Skeletal Class III Correction Using the Skeletal Anchorage System.

Nagasaka H, Sugawara J, et al:

*J Clin Orthod; 43 (February): 97-105*

By using skeletal anchorage to assure proper post-surgical tooth positioning, these authors suggest that Class III surgery can be done right at the start of treatment with several possible advantages.

| Background: Pre-surgical incisor decompensation usually results in worsening of the patient's profile and function before surgery. |
| Objective: To describe and demonstrate a technique where a skeletal Class III individual has orthognathic surgery at the beginning of treatment with incisor compensation and finishing done more quickly in the post-surgical phase. |
| Design/Participants: Technique description and case report of a female aged 17 years with mandibular prognathism. |
| Methods: Typical surgical treatment for Class III skeletal patients involves a difficult period of incisor decompensation prior to surgery. The "surgery first" approach reverses the normal process by predicting the surgical change needed to decompensate the dentition and then doing the surgery at the beginning. This approach leaves that patient with a Class II anterior relationship after surgery that is corrected in the posttreatment phase using skeletal anchorage for all the treatment goals to be met. In this case report, a mandibular setback was done first along with upper second molar extractions to allow distalization of the upper teeth. Miniplate anchors were placed at the time of surgery to use as anchorage for the upper tooth movement. |
| Results: The case report demonstrates full correction of skeletal positions and dental compensations. The total treatment time was only 12 months due to the ease of moving the incisors into a soft-tissue balance rather than fighting lip pressures pre-surgically. |
| Conclusions: The use of a "surgery first" approach in a skeletal Class III patient can speed overall treatment and allow full decompensation of the dentition by incorporating skeletal anchorage for final tooth positioning. |

**Reviewer's Comments:** This is an intriguing approach for a Class III skeletal problem where the tooth position allows the jaws to be placed in the proper relationship prior to incisor decompensation. The advantages for the patient could be significant by eliminating the difficult incisor decompensation time and appearance. The authors claim that there may also be a benefit from the regional acceleratory phenomenon following the surgical procedure that could potentially speed tooth movement. Care must be taken to properly assess vertical and transverse relationships prior to surgery to make sure the skeletal correction addresses all 3 planes of space.

**Additional Keywords:** Skeletal Anchorage System

**print tag:** () Refer to original journal article.
Combined Corticotomy, Skeletal Anchorage Efficiently Corrects Open Bite

Enhanced Effect of Combined Treatment With Corticotomy and Skeletal Anchorage in Open Bite Correction.

Akay MC, Aras A, et al:

J Oral Maxillofac Surg; 67 (March): 563-569

Combining maxillary corticotomy with skeletal anchorage enhances intrusion of posterior teeth to correct anterior open bites.

Background: Although there are several different methods for correcting anterior open bite, one of the most common in adults is orthognathic surgery. However, many adults object to orthognathic surgery, because of costs and/or morbidity. Another option for correcting an open bite with a more minor surgical procedure would be to perform a corticotomy on the maxillary posterior teeth to be intruded, and then use mini-plates as anchors to intrude the corticotomy segments. Will this enhance treatment and what are the effects on root resorption?

Objective: To determine the effectiveness of combining corticotomy with the application of temporary anchorage devices as a proposed method for intrusion of maxillary posterior teeth.

Design/Methods: Retrospective evaluation of 10 patients (6 females, 4 males) with ages ranging from 15 to 25 years who had maxillary corticotomies performed as well as insertion of mini-plates and mini-screws to provide anchors to intrude the osteotomized segments. A force of 200 to 300 g was used to intrude the osteotomy segments. The treatment was completed in 12 to 15 weeks.

Results: The results of this study showed that, in all cases, the intrusion produced a correction of the anterior open bite. The average reduction in open bite was nearly 5 mm. When the authors evaluated the periapical radiographs, they found no root resorption.

Conclusions: Corticotomy combined with temporary anchorage devices can provide an efficient method of intruding teeth to correct open bites.

Reviewer's Comments: Although this study showed success in correcting overbite deformities, I am wondering about the long-term stability. Most treatment of open bite using any kind of orthodontic or surgical means does show some amount of relapse. I would expect the same trend would occur with this sample. It will be interesting to follow these subjects after a few years to determine if the results of this technique are successful long-term.

Additional Keywords: Combined Corticotomy & Skeletal Anchorage

print tag: () Refer to original journal article.
Removal of Bonded RME Appliance Can Result in Transient Bacteremia

**Transient Bacteremia After Removal of a Bonded Maxillary Expansion Appliance.**

Grel HG, Basciiftci FA, Arslan U:

*Am J Orthod Dentofacial Orthop;* 135 (February): 190-193

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**For patients who are at risk for infective endocarditis, use of a bonded rapid maxillary expander should be avoided.**

**Background:** An increasing number of orthodontists are using bonded rapid maxillary expansion (RME) appliances. Does the removal of these appliances allow oral bacteria access to the bloodstream and thus a transient bacteremia?

**Objective:** To investigate the incidence of transitory bacteremia after the removal of a modified acrylic bonded RME appliance.

**Participants:** 25 subjects with an average age of approximately 14 years who underwent RME with a bonded appliance.

**Methods:** Blood samples were drawn prior to and after the removal of the bonded RME appliance. These blood samples were then cultured for bacteria.

**Results:** There was no sign of microbial growth in any blood sample taken before the removal of the modified acrylic bonded RME appliance. Eight of 25 blood samples taken after removal of the appliance showed bacterial growth. Four of these 8 samples isolated *Streptococcus veridans*, which is the most common cause of subacute endocarditis. Although overt soft tissue bleeding was observed in 11 of 25 patients during appliance removal, there was no statistically significant relationship between overt bleeding and bacteremia incidence.

**Conclusions:** Orthodontists should consider the possibility of inducing bacterial endocarditis for at-risk patients when using bonded RMEs.

**Reviewer’s Comments:** This was the first study to investigate bacteremia after the removal of bonded rapid maxillary expansion appliances. I was surprised that *S viridans* was identified in approximately 16% of patients. I was also somewhat surprised that there was no relationship between overt bleeding and the incidence of bacteremia. If you have a patient who is at risk for bacterial endocarditis, I would strongly suggest that you read this article in its entirety.

**Additional Keywords:** Rapid Maxillary Expansion

**print tag:** () Refer to original journal article.
Trauma to Primary Incisors Frequently Disturbs the Developing Permanent Tooth

Effects on Permanent Teeth After Luxation Injuries to the Primary Predecessors: A Study in Children Assisted at an Emergency Service.

Da Silva Assuno LR, Ferelle A, et al:
Dent Traumatol; 25 (April): 165-170

In children who have a luxation injury to the primary incisors, a developmental disturbance in the permanent successor occurs about 20% of the time.

**Background:** Orthodontists frequently see developmental injuries to the enamel of permanent incisors. Parents often want to know the cause of such disturbances.

**Objective:** To recall children with a history of trauma to primary incisors and to examine the permanent teeth for developmental disturbances.

**Design:** Retrospective records review with recall of patients meeting the inclusion criteria.

**Participants:** After review of >5000 records, 844 were identified that met the criteria of luxation trauma to primary incisors. Of these, about 400 returned for follow-up examination.

**Methods:** Records were examined to determine the type of injury and the age at time of injury. At recall, the children's permanent teeth were examined for discoloration or other disturbance. Radiographs were used to assess root disturbances.

**Results:** Males outnumbered females in this trauma group 1.3:1.0. Developmental disturbances were detected at follow-up exam in 20% of children. The most common finding was a white or yellow-brown discoloration of the enamel in the incisal third of the permanent tooth (78%) followed by a discoloration surrounded by hypocalcification (18%). In total, 70% of injuries happened at age 3 years. Root effects were found to be rare. Overall, disturbances were most commonly found in intrusive luxation or avulsion injuries.

**Conclusions:** Developmental disturbances of the permanent dentition are common in children who receive intrusive luxation or avulsion injuries to the primary incisors.

**Reviewer's Comments:** Orthodontists frequently see patients with white or yellow-brown enamel spots on the permanent incisors. This report confirms that most of these are likely due to traumatic injuries to the primary incisors and occur before age 3 years. Although this information does not necessarily aid in the removal or restoration of the enamel spot, it can be helpful to the parent to have an etiologic explanation.

**Additional Keywords:** Luxation Injuries

**print tag:** () Refer to original journal article.
Early Headgear Positively Affects Inclination of Maxillary Canine During Eruption

*Early Headgear Effects on the Eruption Pattern of the Maxillary Canines.*
Silvola A, Arvonen P, et al:
*Angle Orthod;* 79 (May): 540-545

| Early headgear treatment improves the inclination of the maxillary canine, thus potentially preventing impaction of this tooth. |

**Background:** A common treatment for Class II malocclusion in the early mixed dentition is the use of a cervical headgear applied simply to maxillary first molar bands. In these situations, the headgear can move the maxillary molars distally. What effect does this tooth movement have on eruption of the teeth mesial to the maxillary permanent first molar?

**Objective:** To determine the effects of headgear treatment on the eruption pattern of maxillary canines in the early mixed dentition.

**Design/Methods:** This was a prospective randomized clinical trial of 68 subjects with Class II malocclusions. They were randomly allocated to 1 of 2 groups. One group had maxillary first molar bands cemented, and they were given a cervical headgear to wear in order to help correct the Class II relationship. In the second group, no active treatment was rendered other than interceptive tooth extraction of the upper primary canines in 38% and lower primary canines in 35%. Panoramic radiographs were made before and at the end of a 2-year treatment interval to determine any changes.

**Results:** The results of this trial showed that the angle of the erupting canine was found to decrease more quickly in the headgear group compared to the control group. The largest effect was seen at the second evaluation interval, especially on the right side in each subject. The authors believe that headgear treatment can be used to eliminate space deficiency and may be useful in preventing the potential for canine impaction.

**Conclusions:** Early headgear treatment improves the inclination of the maxillary canine, thus potentially preventing impaction of this tooth.

**Reviewer's Comments:** This interesting study shows a correlation between cervical headgear use and an increase in arch length in the maxillary arch, providing for improvement in the inclination and position of the maxillary canine during development. This does make sense. If a patient wears a cervical headgear, the maxillary molars can be moved distally. This could create more space for the teeth to erupt and thereby allow the canine to erupt more distally.

**Additional Keywords:** Canine Eruption

**print tag:** () Refer to original journal article.
Bone Grafting After Extraction Can Enhance Site Prior to Implant Placement

Magnesium-Enriched Hydroxyapatite Compared to Calcium Sulfate in Healing of Human Extraction Sockets: Radiographic and Histomorphometric Evaluation at Three Months.

Crespi R, Cappar P, Gherlone E:

J Periodontol; 80 (February): 210-218

Calcium sulfate can be placed in extraction sockets to preserve bone and enhance healing of the site.

**Background:** When a tooth is deemed hopeless and will be replaced by implants, the tooth must first be extracted. To prevent significant resorption as the socket heals, bone grafting materials can be placed in the socket to accelerate healing and preserve the alveolar bone. Several types of bone grafting materials have been attempted. Is there any difference between these materials?

**Objective:** To compare the radiographic and histomorphometric results of magnesium-enriched hydroxyapatite and calcium sulfate grafts in fresh sockets after tooth extractions.

**Design/Methods:** This was a prospective randomized clinical trial. A sample of 15 patients, 7 women and 8 men, with a mean age of 51 years, required the extraction of 3 teeth prior to implant placement. In each subject, the extraction sites were randomly assigned to 1 of 3 possible groups. In 1 group, calcium sulfate was used to fill the extraction socket. In another group, magnesium-enriched hydroxyapatite was placed in the socket. In the third group, no grafting material was placed and that socket acted as a control. Intraoral digital radiographs were taken at baseline and at 3 months after placement of the graft material. The height of the bone was assessed and compared for each of the 3 sites in each patient. In addition, a trephine was used to extract a biopsy which would indicate the level of healing in each site.

**Results:** The amount of vital bone present in the extraction sockets was greatest for the calcium sulfate group, followed by the magnesium-enriched hydroxyapatite group. In addition, the calcium sulfate showed the least amount of residual graft material after 3 months compared to the magnesium-enriched hydroxyapatite group. Finally, the amount of connective tissue in each area was about the same for both bone graft groups, which were much less than for the control group.

**Conclusions:** More bone formation and faster resorption of the graft material occurred in the calcium sulfate group compared to the magnesium-enriched hydroxyapatite group. Both of the bone graft groups provided a better site for placement of the implant.

**Reviewer’s Comments:** Although this study highlighted the effects of calcium sulfate and magnesium-enriched hydroxyapatite in bone grafting, there are other bone grafting materials as well. I liked this study because it was prospective and 3 different techniques were used in each of the patients. This provides the best data for comparison purposes and therefore requires a smaller sample size, which was evident in this study. The bottom line is that it appears that any sort of bone grafting after tooth extraction can enhance the site prior to implant placement.

*print tag:* () Refer to original journal article.
Further Clarification of Osteoclast Recruitment in Early Orthodontic Tooth Movement

Osteoclast Differentiation and Recruitment During Early Stages of Experimental Tooth Movement in Rats.

Xie R, Kuijpers-Jagtman AM, Maltha JC:
Eur J Oral Sci; 117 (February): 43-50

In this animal model, early differentiation of osteoclasts within the bone marrow was noted and then migration of these cells into the compressed PDL was seen.

Background: Better understanding of the biology of tooth movement is needed to improve orthodontic treatment and lead to better ways to manipulate the biology for improved treatment.

Objective: To examine the differentiation and recruitment of osteoclasts early in orthodontic tooth movement.

Design: Animal model using Wistar rats.

Methods: 40 Wistar rats (5 in each of 8 time groups) were fitted with constant force coil springs moving a 3-molar group mesially. The opposite side of each rat acted as the control. The rats were sacrificed at 8 time points up to 120 hours after appliance activation. The antibody ED1 was used as a marker for osteoclast precursors and MMP9 was used to monitor later differentiation and migration. Presence of ED1 and MMP9 positive cells was used to monitor the differentiation and migration of osteoclasts.

Results: The number of osteoclast precursors rose rapidly in the bone marrow after application of orthodontic force and then returned to normal levels as the osteoclasts migrated to the periodontal ligament (PDL) in areas of hyalinization. Within the PDL, the cell population initially drops during compression, but then increases as osteoclasts are recruited for direct bone resorption.

Conclusions: The authors suggest that osteoclasts in areas of hyalinization originate from the bone marrow and those for direct bone resorption are recruited from precursors within the PDL.

Reviewer's Comments: Although a bit difficult to read and understand for the average clinician, these studies are critical to our understanding of the biology of tooth movement. Better understanding of the biology and the role of various signaling agents could lead to more rapid and predictable tooth movement.

Additional Keywords: Experimental Tooth Movement

print tag: () Refer to original journal article.
Radiation Dose From Cone Beam CT Varies Widely With Machine, Settings

Absorbed and Effective Doses From Cone Beam Volumetric Imaging for Implant Planning.

Okano T, Harata Y, et al:

Dentomaxillofac Radiol; 38 (February): 79-85

A limited field of view cone beam CT has a much lower dose than a high energy, full-head cone beam CT image or a conventional medical CT unit.

**Background:** Increased use of cone beam CT imaging in orthodontics has increased the need for better understanding of the radiation dose to the patient for such imaging procedures.

**Objective:** To measure the radiation dose for implant planning using a limited field of view (FOV) cone beam machine, a full-head cone beam unit, and a conventional medical CT.

**Design:** Laboratory study using a phantom.

**Methods:** The 3 imaging machines tested were the 3D Accuitomo (limited FOV), the CB MercuRay, and a GE medical CT machine. A standard phantom was used for placement of dosimeters, and tissue and organ doses were measured with radiophotoluminescence. The absorbed dose and effective dose were calculated using these readings from repeated trials.

**Results:** The effective dose for the 3D Accuitomo were between 18 and 66 Sv. The CB MercuRay was much higher at 450 Sv, and the medical CT unit was highest at nearly 600 Sv.

**Conclusions:** The effective radiation dose for implant planning varies widely depending upon what unit is used for scanning and based on the settings for the scan. In general, the medical CT unit has the highest radiation dose, a large FOV unit on high settings has somewhat less, and a limited FOV unit would have the lowest.

**Reviewer's Comments:** This study was designed to look at radiation exposure for implant planning, not orthodontics. As a result, it is hard to use this information directly for selection of orthodontic imaging. The challenge is that the small FOV units like the Accuitomo don't give us the skeletal information we need to replace a lateral ceph, and so while it may be useful for looking at impacted canines or other localized areas, it would not eliminate the need for a ceph and pan. The authors also mentioned that they were able to reduce the effective dose for the CB MercuRay significantly by reducing the mA and kV settings. Using the optimal settings for the specific imaging requirement is obviously the goal and we need more information about this for orthodontic applications.

**Additional Keywords:** Implant Planning

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Horizontal Force Reduces Vertical Tooth Eruption

Orthodontic Force Decreases the Eruption Rate of Rat Incisors.
Drevenek M, Volk J, et al:
Eur J Orthod; 31 (February): 46-50

In this animal model, a horizontal force on the incisors reduces the vertical tooth eruption. Whether this would be a method of vertical tooth control in humans is not known.

**Background:** Good animal models of orthodontic tooth movement are needed to learn more about the biologic process.

**Objective:** To determine the effect of constant horizontal pressure on the vertical tooth position in an animal model.

**Design:** Laboratory study using Wistar rats aged 11 to 12 weeks.

**Methods:** The rats were divided into 2 groups of 10. One group acted as controls and the other had orthodontic force placed between the incisors and upper left molar. A groove was cut in the incisors to allow measurement of vertical tooth eruption in all animals. Tooth eruption of the upper and lower incisors was measured every 2 days for a total of 10 days.

**Results:** Incisor tooth eruption was reduced in the group that had horizontal orthodontic force compared to controls by almost half. This was true for upper incisors and for lower incisors.

**Conclusions:** An orthodontic force in a horizontal direction reduces the vertical incisor tooth eruption by almost half.

**Reviewer's Comments:** This project was undertaken to verify this particular appliance design as being adequate to model orthodontic tooth movement. The finding that interested me was the reduced vertical tooth eruption that took place in the experimental group. If this is true in humans as well, we may be able to use this knowledge to better control the vertical incisor position in orthodontic patients during horizontal tooth movements. The impact that placing the upper appliance had on lower incisor eruption also suggests that occlusal forces may be very important in the rate of vertical tooth eruption.

**Additional Keywords:** Tooth Eruption
**Absolute Changes in Craniofacial Dimensions After Puberty in Class II Subjects Minimal**

*Dentofacial Growth Changes in Subjects With Untreated Class II Malocclusion From Late Puberty Through Young Adulthood.*

Baccetti T, Stahl F, and McNamara JA:


Patients with Class II, division 1 malocclusions do not experience significant growth changes from late puberty through young adulthood.

**Background:** There are many studies evaluating growth changes during the pubertal growth spurt. It would be interesting to note if similar changes occur from late puberty to young adulthood.

**Objective:** To compare dentofacial growth changes in untreated subjects with Class II, division 1 malocclusion with those in subjects with normal Class I occlusion from late puberty through young adulthood.

**Participants/Methods:** The sample for this study consisted of 23 subjects with Class II, division 1 malocclusion and 30 subjects with Class I occlusion. All these subjects were untreated and had lateral cephalometric radiographs taken at the late pubertal and early adulthood stages of growth and development. Growth changes that occurred from the post-pubertal stage of development to young adulthood were compared between the Class II, division 1 and Class I patients.

**Results:** From late puberty through young adulthood, dentofacial growth in subjects with untreated Class II malocclusion did not show significant differences when compared with untreated subjects with normal occlusion. Absolute changes in craniofacial dimensions in Class II subjects after puberty were minimal.

**Conclusions:** Patients with Class II, division 1 malocclusions do not demonstrate significant growth changes from late puberty to young adulthood.

**Reviewer’s Comments:** I found this to be a very interesting study. I was not surprised to find out that there were minimal growth changes during this time period. I was somewhat surprised to find out that there were no significant differences between the Class II, division 1 and the Class I patients for the minimal changes that did occur. This might be a result of a small sample or not differentiating the patients who had Class II, division 1 malocclusions due to maxillary dental protrusion from those that were due to anteroposterior skeletal discrepancies.

**Additional Keywords:** Class II Patients

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Are Growth Patterns Altered by Congenital Absence of Permanent Teeth?

Craniofacial Growth Patterns in Patients With Congenitally Missing Permanent Teeth.
Bauer N, Heckmann K, et al:
J Orofac Orthop; 70 (March): 139-151

The congenital absence of permanent teeth does not alter growth patterns.

**Background:** It is not unusual for an orthodontist to treat patients who have congenitally missing permanent teeth. Is there a relationship between an altered growth pattern and congenitally missing teeth in these patients?

**Objective:** To investigate any correlations between the congenital absence of certain permanent teeth and individual cranial growth patterns.

**Participants:** 101 patients with various congenitally missing teeth who were about to undergo orthodontic treatment.

**Methods:** Lateral cephalometric radiographs were taken prior to the initiation of orthodontic treatment. Using established cephalometric measurements based on these norms, the authors categorized patients as having a neutral growth pattern, a horizontal growth pattern, or a vertical growth pattern. Patients were evaluated in 4 groups: (1) all patients; (2) patients with second premolar agenesis; (3) patients with upper lateral agenesis, and (4) patients with various or atypical congenitally missing teeth.

**Results:** When the overall sample was evaluated, approximately one third of patients had a vertical growth pattern, one third had a neutral growth pattern, and one third had a horizontal growth pattern. There were no significant correlations between the kind of congenitally missing teeth and growth patterns. Females were twice as likely to have congenitally missing teeth as males.

**Conclusions:** There is no statistically significant relationship between the congenital absence of permanent teeth and growth pattern.

**Reviewer’s Comments:** I have often wondered if there was any relationship between congenitally missing teeth and the patient’s growth pattern. The only problem that I have with this study is that it did not actually measure growth changes in these patients. The authors simply accepted the proposition that growth patterns can be determined on the basis of initial cephalometric measurements. While these cephalometric measurements may accurately predict growth patterns in some patients, not all patients have growth patterns that correlate with initial cephalometric measurements. I thought it was interesting to note that females were twice as likely to have congenitally missing teeth as males.

**Additional Keywords:** Congenitally Missing Permanent Teeth

**print tag:** () Refer to original journal article.
Class III Dental Compensations Not Always Removed Prior to Surgery

Comparison of Incisor Inclination in Patients With Class III Malocclusion Treated With Orthognathic Surgery or Orthodontic Camouflage.
Troy BA, Shanker S, et al:
Am J Orthod Dentofacial Orthop; 135 (February): 146.e1-146.e9

This study found no statistically significant difference in incisor inclination and position between a Class III surgical group and a Class III group treated with dental compensation and orthodontics alone.

Background: Patients who have skeletal relationships within a range of normal can be treated with either orthodontics alone or combined surgical orthodontic treatment. It is expected that patients treated with these 2 different approaches would have significantly different incisor angulations at the end of treatment. Is this true?

Objective: To compare dental and skeletal values of Class III patients treated with orthodontics alone versus with orthognathic surgery.

Participants: The sample for this study consisted of 33 surgical Class III patients and 39 Class III patients treated with orthodontics alone using dental compensation.

Methods: Lateral cephalometric radiographs were taken pretreatment, presurgery (for the surgical group only), and at the completion of treatment. Maxillary and mandibular incisor angulations were recorded at the 3 different time periods and compared.

Results: At pretreatment, surgery patients had more severe skeletal discrepancies and more compensated incisors. During presurgical orthodontic treatment, most of the surgery groups' mandibular incisors were significantly decompensated, although half of the maxillary incisors remained compensated. After treatment, there were no differences between incisor positions of the 2 groups.

Conclusion: There was no statistically significant difference in incisor inclination and position between the Class III surgical group and the Class III group treated with dental compensation and orthodontics alone.

Reviewer's Comments: I do not question the accuracy of measurements made in this study; however, the results do not make sense to me. If you are going to correct a Class III patient with orthodontics alone, the goal of treatment should be to induce dental compensations, ie, protrusion of the maxillary incisors and retraction of mandibular incisors. If you are going to treat a Class III patient with surgery, the goal is just the opposite, ie, to remove the dental compensations and maximize the negative overjet to increase the skeletal and profile changes that could be made during surgery. Therefore, there should be significant differences in the incisor angulation between groups at the end of treatment. It seems to me that the only way that the incisor inclinations could be similar for the 2 groups at the end of treatment is the possibility that the incisal compensations in the surgical group were not completely removed presurgically.

Additional Keywords: Orthodontics Alone vs Orthognathic Surgery

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Impact of Third Molar Agenesis on Craniofacial Morphology

Third Molar Agenesis and Craniofacial Morphology.
Sanchez MJ, Vicente A, Bravo LA:
Angle Orthod; 79 (May): 473-478

Agenesis of maxillary third molars is related to a reduced mandibular plane angle.

**Background:** Maxillary and mandibular third molars are the most common congenitally missing teeth. Is there a genetic association between congenital absence of these teeth and any alteration that might occur concomitantly in the growth and development of either the maxilla or the mandible?

**Objective:** To determine the existence of any relation between bilateral agenesis of the maxillary or mandibular third molars with the anteroposterior dimensions of the maxilla and mandible and with the skeletal pattern of the subject.

**Participants/Methods:** 97 subjects aged 13 to 18 years (53 males and 44 females) were evaluated. Based on an evaluation of cephalometric radiographs, 27 subjects had agenesis of the maxillary third molars, 35 had agenesis of the mandibular third molars, and another 35 had third molars and were used as controls. Cephalometric radiographs were used to establish the cephalometric parameters for each of the subjects. Then these were compared among the groups to determine any differences in facial proportions.

**Results:** For most cephalometric measurements, there were no statistically significant differences. However, mandibular plane angle values for maxillary and mandibular third molar agenesis groups were significantly lower than for the control group. In the mandibular agenesis group, the lower facial height was significantly less than in the control group.

**Conclusions:** Maxillary third molar agenesis is related to reduced mandibular plane angles, and the mandibular third molar agenesis group showed diminished lower third facial height with a facial morphology resembling a brachyfacial pattern.

**Reviewers Comments:** Although this study supports the hypothesis that third molar agenesis may be associated with a brachyfacial pattern, I believe that the sample size was relatively small. I would like to see this study done on a larger sample to determine if, in fact, a correlation and not simply an association exists.

**Additional Keywords:** Craniofacial Morphology

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