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Diagnosing Early Interceptive Orthodontic Problems – Part 1

A Peer-Reviewed Publication

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Publication date: March 2011
Expiry date: February 2014

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Educational Objectives

Upon completion of this course, the clinician will be able to do the following:

1. List and describe normal growth and development of the dentition and its phases.
2. Describe the early treatment examination and list the records that are required for this examination.
3. List the factors and potential problems to consider during the early treatment examination.
4. List and describe the fixed and removable appliances that can be used as space maintainers and habit breakers during the mixed dentition phase.

Abstract

It is important to have a clear picture of how a child is changing dentally and skeletally throughout his or her growth period. In fact the American Association of Orthodontists recommends that every child have an orthodontic examination by the age of seven. The early treatment examination in the mixed dentition enables the practitioner to identify problems at an early stage, and to determine when to commence treatment and/or refer patients to an orthodontist. Things to look for during a mixed dentition examination include crowding of permanent teeth, excessive overjet or overbite, missing primary teeth needed for space maintenance, supernumerary teeth, skeletal discrepancies, habits, airway problems, and eruption path problems.

Introduction

This continuing dental education article is being written to describe the need for early examination and diagnosis of malocclusions in growing children. A short review of growth and development will be presented, along with a description of the stages of tooth eruption. After completing this course, the reader will have a clearer understanding of problems associated with children in the mixed dentition stage of development.

The American Association of Orthodontists recommends that every child have an orthodontic examination by the age of seven. By then, the maxillary and mandibular first molars, lateral incisors, and central incisors should have erupted. This article will describe what practitioners should be looking for during an early treatment examination in the mixed dentition and aid them in determining what they should treat and/or when they should refer.

This article has been broken into two parts. Part 1 will include a discussion of the mixed dentition examination, records, tooth eruption sequence, growth and development, primary teeth as space maintainers, normal eruption of permanent teeth, delayed eruption of permanent teeth, over-retained primary teeth, and supernumerary teeth.

Part 2 will cover: excessive deep bites, crossbites, anterior crossbites, class III skeletal and dental problems,

crowding in the mixed dentition, excessive spacing, open bites and class II skeletal or dental problems.

The Mixed Dentition Orthodontic Examination

When performing a mixed dentition examination, the main goal is to determine whether there is need for interceptive orthodontic measures that will allow for the eruption of all the permanent teeth. The earlier in the mixed dentition stage a problem is diagnosed and corrected, the better off patients will be as they continue to grow. When performing an interceptive orthodontic examination, the following records are needed.

Records

Study Models

Study models are necessary because they allow you to evaluate the occlusion outside of the patient's mouth. For example, abnormal wear patterns and crossbites can easily be seen. Study models also allow the practitioner to perform a mixed dentition analysis. Many mixed dentition analyses exist, such as the Tanaka and Johnston and Moyer's prediction values. An accurate bite registration must also be taken as part of this record.

Radiographs

Panoramic Radiograph

In the mixed dentition phase, the panoramic radiograph is useful for seeing permanent erupting teeth, crowding of teeth, space or lack of space between teeth, eruption paths, third molars, supernumerary teeth, and root apex formation (which is used to determine the patient's dental age). Using a panoramic radiograph is like seeing the world through a wide-angle lens, as compared to looking through a small looking glass, which could be considered analogous to full-mouth series of radiographs.

Lateral Head Film (Cephalometric Radiograph)

Lateral head films are necessary when evaluating growing children to evaluate dentofacial proportions. As teeth erupt and growth occurs, the teeth relationships (within the jaws and skull) are part of a much bigger picture only visible with a cephalometric film and the appropriate cephalometric tracing. In the mixed dentition, the following guidelines are designed to help in the decision process on when a cephalometric film is indicated.

Class II Patients:

Patients presenting with Class II dental relationships such as a distal step in primary second molars.

Patients with Class II relationships of permanent molars.

Patients who have a significant positive overjet and/or patients with mandibular retrusive profiles.

Class III Patients:

Patients with Class III relationships of permanent molars.

Patients who have a mesial step of primary second molars.

Patients who have a significant negative overjet (underbite).

Patients who have a protrusive profile of the mandible or retrusive profile of the maxilla.

Airway problems:

Airway problems diagnosed in children with open mouth breathing tendencies, such as turned up noses, allergic salute (wiping the nose with the hand in an upward swipe), or other medical history findings.

Vertical relationship problems:

Vertical relationship problems such as open bites associated with habits, airway problems, vertical skeletal growth problems, or patients with lip incompetency (lips do not touch or seal at mandibular rest).

Serial Lateral Head Films

Serial lateral head film radiographs are useful when monitoring growth in children with Class II or Class III tendencies, beginning at the first visit you diagnose them. They are also useful in comparing what orthodontically has really occurred after patients have been treated, by comparing pre- and post-treatment films.

Photographs

It is recommended that a full series of orthodontic photographs is taken for all patients. There is a proper way to take photographs, along with a way to retract soft tissues to capture vital anatomy, such as molar relationships.

The standard orthodontic photographs consist of eight pictures. Extraoral Photos: profile, frontal facial smiling, frontal facial at rest. Intraoral Photos (teeth in occlusion): maxillary occlusal, mandibular occlusal, right and left buccal dental, and frontal dental.

There are other useful photos one can take when documenting an examination. For example, a patient with a tooth interference that causes a shift when intercuspation occurs can be documented by photographing the midlines at rest and with the teeth apart. When the patient occludes, the midlines will change, demonstrating the shift.

Close-up shots of individual teeth are also useful when documenting chips or decalcifications that you may be blamed for in the future after orthodontic treatment has been completed.

Other Records

Other records may also be needed, depending on the oral examination, such as anterior-posterior films (AP films) (for transverse analysis), cone-beam 3-D imaging films (the new frontier in radiology), and/or occlusal films.

Growth and Development

Eruption of Teeth

By definition, the mixed dentition has both primary and permanent teeth in function. The primary dentition ends with the first eruption of a permanent tooth. It is not age dependent. The mixed dentition phase ends when there are no longer any primary teeth in the mouth. This becomes the permanent dentition.

Prior to age five, most children will have only their primary teeth. At ages six to seven, the first permanent molars will erupt. Permanent centrals will usually erupt between the ages of six and seven. Lateral incisors will usually erupt between the ages of seven and eight. This sets the stage for future eruption of the remaining twelve permanent teeth (permanent maxillary and mandibular cuspids, first and second premolars) between the ages of ten and eleven. At twelve years of age, the four second permanent molars erupt. For those who have wisdom teeth, they erupt by age twenty in most cases.

The ages stated above are just basic guidelines. It is important to know that chronological age does not follow dental age, nor does it correlate with children's height, weight, or mental development. This is a common question asked by parents.

Growth of the Maxilla and Mandible

Growth in the cranial base pushes the maxilla forward, as well as active growth in the maxillary sutures that is responsible for the passive displacement of the maxillary process. As the maxilla is translated downward and forward, bone is added at the sutures and in the tuberosity area posteriorly, while at the same time surface remodeling removes bone from the anterior surfaces. For this reason, the amount of forward movement of anterior surfaces is less than the amount of displacement. In the roof of the mouth, however, surface remodeling adds bone, while bone is resorbed from the floor of the nose. The total downward movement of the palatal vault, therefore, is greater than the amount of displacement. Between the ages of seven and fifteen, one-third of the total forward movement of the maxilla can be accounted for by this passive displacement. It can be concluded that two-thirds of the growth during that time is via active growth at the sutural level. If cranial or facial bones are mechanically pulled apart at the sutures, new bone will fill in, and the bones will become larger than they would have been otherwise. If a suture is compressed, growth at that site will be impeded. It is imperative to understand the growth sequence in order to properly diagnose maxillary excess or deficiency and to treat orthopedically.

Mandibular growth occurs by both endochondral proliferation at the condyle and apposition and resorption of bone at surfaces. The mandible is formed from Meckel's cartilage. The two halves of the mandible are united at the anterior midline by a suture at the symphysis. Further growth continues at this suture until it ossifies during the first year of life. Throughout growth the mandible is translated downward and forward. It

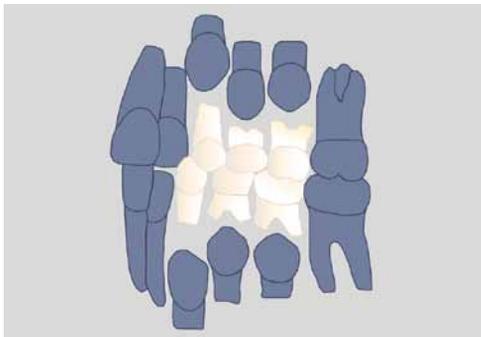
seems that the mandible is translated in space by the growth of muscles and other adjacent soft tissues and that addition of new bone at the condyle occurs in response to the soft tissue changes. On average the ramus height increases 1 to 2 mm per year and body length increases 2 to 3 mm per year.

The maxilla and mandible grow in all three planes of space, in the following sequence: width, length, and then height. In both sexes, growth in vertical height of the face continues longer than growth in length, with the late vertical growth primarily in the mandible. Increase in facial height and concomitant eruption of teeth continue throughout life.

Primary Teeth Act as Space Maintainers

The primary cuspids and first and second primary molars act as space maintainers for the permanent erupting cuspids and premolars. The permanent premolars are smaller than the primary molars they replace. In the maxilla an average of 1.5 mm of space exists and in the mandible 2.5 mm due to the differences in size of these teeth. This space is called Leeway space. The primary cuspids and first and second primary molars not only act as space maintainers for the permanent cuspids and first and second premolars, but also act as a guide for the permanent teeth to follow when erupting (Figure 1).

Figure 1. Primary Teeth as Space Maintainers



Space Maintenance

It is essential that children be evaluated for missing primary teeth in order to determine if any space maintenance is necessary. As a general rule of thumb, it is recommended that all space created by a missing primary tooth should be maintained. When in doubt, maintain space.

If there is an early loss of a primary molar and the first permanent molar has erupted, space maintenance must be employed as soon as possible. Doing so will prevent the first permanent molar from drifting mesially. If the first molar is allowed to drift mesially, it will not only eat up the Leeway space, but it can potentially interfere with the eruption of the premolars or canines.

Posterior Space Maintenance

Space maintainers are very important to keep this Leeway space intact until eruption of the permanent teeth occurs. There are two basic categories of space maintainers: fixed and

removable. As a rule, fixed appliances are generally used as space maintainers. The two types are unilateral and bilateral.

The unilateral space maintainer can be used in very young children who have lost a single primary posterior tooth but only when you are sure that the successor tooth will not erupt for many years. Otherwise when using a space maintainer consider using a bilateral space maintainer because:

1. If a permanent tooth is erupting a properly designed bilateral space maintainer will not cause you to have to remove the new appliance you just placed.
2. If there is need for other space maintenance on the other side of the arch, a bilateral appliance would be a better choice.

Figure 2 demonstrates a unilateral space maintainer used in the arch with the opposite side left untreated. Perhaps a better appliance choice would have been one that would have maintained space throughout the entire arch.

Figure 2. Unilateral Space Maintainer



Here are some questions that should be asked when evaluating whether there is enough space in the mixed dentition patient:

How much anterior mandibular crowding is present (teeth numbers 23, 24, 25, and 26)?

Is there enough Leeway space to accommodate the lower crowding plus the unerupted permanent teeth (cuspid and premolars)?

How much anterior maxillary space (or crowding) is present (teeth numbers 7, 8, 9, and 10)?

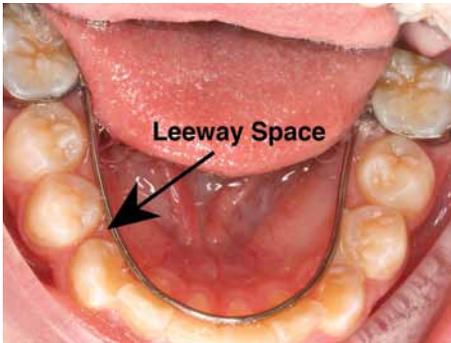
This is where the mixed dentition analysis and the panoramic radiograph become useful.

Analyses such as the Tanaka and Johnston method measure one half of the mesiodistal width of the four lower incisors. Then by adding 10.5 mm to this number the space needed for the mandibular canine and premolars in one quadrant can be estimated. Add 11 mm to estimate the space required for the maxillary canine and premolars in a maxillary quadrant. This method has good accuracy for children of European descent. This method will overestimate the required space for Caucasian females in both arches and underestimate the space required in the lower arch for African-American males.

An excellent reference for the mixed dentition analysis can be found in The Practice Building Bulletin, Volume IV, Issue XIX, located at www.appliancetherapy.com, under practice building bulletins.

The lower lingual holding arch (LLHA) in the mixed dentition is readily used to maintain the Leeway space in children with minor to moderate crowding (Figure 3). Note the Leeway space maintained on the lower right segment between the first premolar and the cuspid.

Figure 3. Lower Lingual Holding Arch



The transpalatal arch appliance is used in the maxillary arch as a bilateral space maintainer (Figure 4).

Figure 4. Transpalatal Arch Appliance



If maximum anchorage is needed, a Nance button can be added to a maxillary appliance which touches the palate, preventing mesial movement of the maxillary molars (Figure 5).

Figure 5. Nance Button Appliance



The following case demonstrates a maxillary arch with no crowding and with a normal eruption pattern (Figure 6). In the mandibular arch (Figure 7), there is minor crowding that will be resolved by using the Leeway space that is maintained by using a fixed lingual holding arch.

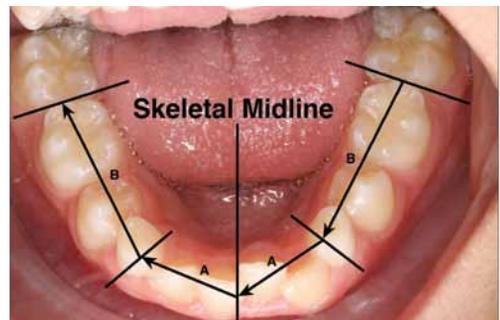
Figure 6. Maxillary Arch with No Crowding



When a patient receives a fixed lower lingual holding arch, it maintains the space that the primary cuspids and primary molars are occupying. Once exfoliation occurs, the anterior crowding can be distalized into the Leeway space. From the mixed dentition analysis, the following were labeled:

- A. Corrected lateral position, which corrects for excess space or crowding in the anteriors, demonstrating the space the laterals will occupy when uncrowded and properly aligned.
- B. True available space, which is measured from the mesial of the first molar to the the corrected later position (Figure 7).

Figure 7. Mandibular Arch with Minor Crowding



In Figure 8, the panoramic radiograph demonstrates enough Leeway space for the permanent teeth to erupt. Note, it is difficult to see the crowding in the anterior teeth on a panoramic film.

Figure 8. Panoramic Radiograph Demonstrating Sufficient Leeway Space



Anterior Space Maintenance

There are three categories of anterior space maintainers: fixed, removable-functional, and removable-static. Anterior space needs to be maintained for esthetics, normal speech and phonetic development, and to allow normal oral maxillofacial development.

The best fixed appliance for anterior space maintenance in arches that do not need arch development is the Groper appliance (Figure 9).

Figure 9. Groper Appliance



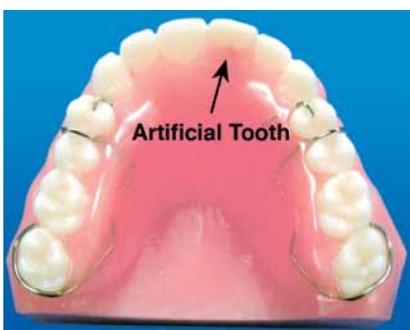
When arch development is needed, removable-functional appliances like the Schwarz can be used, delivering esthetics during arch development (Figure 10).

Figure 10. Maxillary Schwarz Appliance



The next category, removable-static, is represented by Hawley-type appliances that have an artificial tooth placed. As permanent teeth erupt, adjust the acrylic to accommodate the needed space. Its main use is in trauma cases and cases that have congenitally missing teeth (for example, lateral incisors). A labial bow can be used to add retention if desired (Figure 11).

Figure 11. Hawley Flipper



Delayed Eruption

Children who have a single tooth that is not erupting comparably to the tooth on the opposite side (same arch) should be watched and reevaluated in (three- to six-month) increments to determine if interceptive treatment is needed. There are many possible causes for the delay of the eruption. One of the most common is an earlier trauma to the region. It is sometimes necessary to perform surgical exposure to gingival tissue that may be holding up the eruption process. Today these procedures are quite easy, using laser technology to open a small window in the tissue that will allow the teeth to erupt. In cases where the bone is holding up the eruption, it is best to have an oral surgeon remove the bone, leaving a window for the tooth to erupt through. It is rare that these teeth are ankylosed, or have lost their eruption potential.

Figures 12 and 13 demonstrate tooth number 9 almost erupted, with tooth number 8 delayed. The primary right central incisor is still present in this patient with a complete root.

Figure 12. Panoramic Radiograph Showing Delayed Eruption

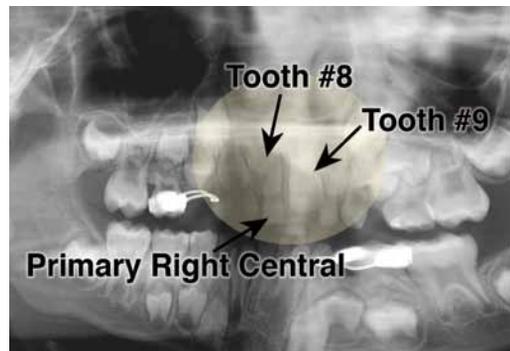


Figure 13. Delayed Eruption of Tooth Number 8



In many cases, after teeth have been surgically exposed and still do not erupt on their own, a bonded button and some elastic force anchored to either a removable appliance or fixed brackets may be needed to facilitate the movement.

If no movement occurs after forces have been applied for a short period, the tooth may be ankylosed. This will require some form of luxation, which hopefully will free up the tooth and allow the eruption to occur.

Retained Primary Teeth

Retained primary teeth need to be extracted to allow for the eruption of the permanent successors (Figure 14). It is not exactly known why some primary teeth do not exfoliate, but in the event you see a primary tooth with no mobility and the successor stuck below it, you should extract the tooth to allow for normal eruption.

Figure 14. Retained Primary Teeth



Some of the mesial root of the primary first molar did not resorb and can be clearly seen on the radiograph.

Supernumerary Teeth

Diagnosis of supernumerary teeth is best made early, and treatment planning their extraction should begin as soon as an oral surgeon deems it appropriate. In many instances, the oral surgeon may elect to wait some time before removing them in order to prevent damaging adjacent teeth. Set up a consult as soon as supernumerary teeth are discovered. If you are planning on moving teeth orthodontically, supernumerary teeth need to be removed prior to starting treatment. The most frequent place for supernumerary teeth to be present is in the maxilla. Figure 15 illustrates three supernumerary teeth.

Figure 15. Supernumerary Teeth



Habits/Environment/Speech Problems

Detection of poor habits and speech problems needs to be addressed as early as possible. In some instances, excessive environmental forces (for example, playing a musical instrument) can alter growth if forces are applied over long periods of time. The habits of children, both nocturnal and

during the daytime, can alter tooth positions and skeletal development in some cases. Practitioners should examine all children for signs of habits and their associated actions that may change the way an individual child grows.

Children with airway obstruction, presenting with enlarged adenoids or tonsils, should be evaluated for surgical removal of these tissues. Find an ENT in your area who will help you diagnose and confirm possible airway obstruction and will take the measures necessary to perform the surgeries when needed. In undiagnosed airway obstruction, jaws can grow narrow, due to the open mouth breathing positions. The muscles of the face constrict the jaws and can lead to a condition called Adenoid Facies and Narrow Face Syndrome.

If it is suspected that a child may have an obstructive airway, it is recommended that the patient see a specialist and have a sleep study. The dangers of obstructive sleep apnea are well documented in both children and adults. Dental practitioners may be the first line of defense in diagnosing these problems. Symptoms children who have obstructive sleep apnea exhibit include restlessness, inability to do well in school, irritability, etc. For an excellent article on sleep apnea, go to www.appliancetherapy.com and download the Practice Building Bulletin on sleep apnea. Articles on sleep apnea can also be found at www.ineedce.com.

Speech Problems, Tongue Position, or Thrust Problems

Tongue position problems can cause dental anterior open bites, which if not treated early can lead to unfavorable skeletal growth. Normal speech development is virtually impossible if the tongue is not able to position properly against the palate and teeth.

Students of early treatment often debate whether the tongue thrust is truly a thrust or a position the tongue takes to create a seal needed for swallowing. Some patients have vertical growing skeletal patterns that can result in open bites. Some children with airway problems who are forced to breathe through their mouths can also exhibit narrowing of arches, resulting in transverse discrepancies with open bites, affecting tongue position. Regardless, tongue thrust or tongue position problems are very important to diagnose and correct.

First, assess if there are any underlying speech problems. If so, refer the patient for therapy right away. Attempting to correct a speech problem later in life results in poorer prognoses.

Then ask the patient to swallow as you gently force the lips open with a gloved finger to see if the tongue is pushing forward. It instantly becomes obvious that the tongue is filling the space, and now a diagnosis needs to be made to determine if this is a simple tongue thrust or a more complex problem involving the airway or vertical

Figure 16. Tongue Thrust Habit



Figure 17. Bonded Tongue Crib Prior to Treatment



Figure 18. Bonded Tongue Crib During Treatment



skeletal growth. Figure 16 illustrates the tongue at rest in a patient with a tongue thrust habit. Even when the patient is not swallowing (posing for a picture), the tongue decides to rest in this position maintaining the open bite.

Tongue appliances can be both fixed and removable. Fixed appliances use two bands cemented on either the permanent first molars or the primary second molars.

Some practitioners use removable appliances for tongue problems, but to work, the appliance needs to be worn all the time, even when eating.

Children adapt quickly to speaking normally and are instructed to place their tongues up against the anterior hard palate when swallowing.

After approximately six to eight months, remove the appliance and evaluate whether the problem has been resolved. When using a fixed tongue crib, it will usually work within this time frame. Because habits can be difficult to correct, it is necessary to evaluate the patient within three months after the appliance therapy ceases, in order to make sure that the habit is actually broken and the open bite does not return. If the problem does return, replace the appliance for another four months, and reevaluate.

Figures 17 shows a bonded tongue crib prior to treatment. Figure 18 demonstrates the open bite closing. Note, in most cases the open bite will close most of the way, but in this case, additional intervention such as fixed braces will be needed.

Another appliance that is used to aid in training the tongue from moving forward is the transpalatal spinner. The patient is informed that every time they swallow, they are to reach back with the tip of the tongue upon swallowing (Figure 19).

Figure 19. Transpalatal Spinner



Figure 20 illustrates a removable Hawley tongue crib appliance. In order for this appliance to work, it needs to be worn all day and night except when eating.

Figure 20. Removable Hawley Tongue Crib



Digit and Other Habits

Digit (finger) habits can include sucking, nail biting, and other habits including pen/pencil biting. They are also best solved by using fixed bonded appliances. Leave the appliance in for approximately six months, and then remove it and evaluate if the child is continuing to place digits in his or her mouth.

With digit habits, the bonded appliance alters the way the digit feels when inserted in the mouth. The bluegrass roller is an excellent appliance for eliminating digit habits (Figure 21). After successfully wearing a tongue or digit habit appliance and eliminating the tooth moving forces created by the digit, the natural forces from the muscles in the cheeks and lips will correct the protrusion in most cases.

Figure 21. Bluegrass Roller Appliance



Summary

In accordance with the recommendations of the American Association of Orthodontists, the early treatment examination of the mixed dentition should be performed by age seven. During this examination radiographs, models and orthodontic photographs are required. Additional records may also be necessary depending on the patient. During the examination, it is important to consider primary teeth as space maintainers and to identify any problems that may require intervention. Potential problems can include early loss of primary teeth, retained primary teeth, delayed eruption of permanent teeth, supernumeraries, and habits. Early assessment enables the early identification of problems, intervention and optimal timing of referral and/or treatment for the patient.

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Authors Profiles

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Dr. Florman received his dental degree from the Ohio State University and completed his post graduate training in Orthodontics at New York University. Dr. Florman is a Diplomate of the American Board of Orthodontics, and has been practicing dentistry since 1991. He has authored over forty scientific publications in the field of dentistry and medicine, and is an active clinical advisor to many pharmaceutical and dental companies. He is a member of the American Dental Association, California Dental Association, and the American Association of Orthodontists



Rob Veis, DDS

Dr. Rob Veis began 24 years ago as a general dentist, and taught for twelve years at the University of Southern California as a Clinical Professor in Restorative Dentistry. Dr. Veis lectures for the AGD/California masters program. He also lectures internationally, on the integration of orthodontics and appliance therapy into the general practice on behalf of Space Maintainers Laboratories where he has been a member of the teaching staff since 1990. He is coauthor of the comprehensive textbook Principles of Appliance Therapy for Adults and Children, and author of several Practice Building Bulletins. Dr. Veis is a member of the California Dental Association and the Academy of General Dentistry.

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Dr. Al-Arabi obtained his dental degree from the University of Tishreen, Syria in 1996. He received his training in Orthodontics and Dento-Facial Orthopedics at the University of Aix-Marseille II earning a Certificate of Special Studies in Clinical Orthodontics (CECSMO) in 2002, and is a former member of the French Society of Dento-Facial Orthopedists and the French Society of Bioprogressive. Dr. Al-Arabi joined the faculty at Jacksonville University in July 2003. He is a member of the American Association of Orthodontists.

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Questions

- The American Association of Orthodontists recommends that every child has an orthodontic examination by age _____.
 - five
 - seven
 - nine
 - eleven
- The main goal of a mixed dentition examination is _____.
 - to determine whether there is a need for multiple extractions
 - to determine whether there is a need for interceptive orthodontic measures
 - to assess the patient's caries experience
 - none of the above
- The records needed when performing an interceptive orthodontic examination are _____.
 - panoramic and cephalometric radiographs
 - study models
 - orthodontic photographs
 - all of the above
- Serial lateral head films are useful when patients have _____.
 - Class I tendencies
 - Class II tendencies
 - Class III tendencies
 - b and c
- Other records that may also be needed for an interceptive orthodontic examination include _____.
 - anterior-posterior films
 - cone-beam 3-D images
 - occlusal films
 - all of the above
- Chronological age always correlates with a child's _____.
 - dental age
 - height and weight
 - mental development
 - none of the above
- Lateral incisors usually erupt between the ages of _____.
 - four and five
 - five and six
 - six and seven
 - seven and eight
- During growth, the amount of forward movement of the anterior surfaces of the maxilla is _____ the amount of displacement.
 - less than
 - the same as
 - more than
 - any of the above
- Late vertical growth occurs primarily in the _____.
 - symphysis
 - maxilla
 - mandible
 - tuberosity
- The space maintained by the primary cuspids and molars for the permanent erupting cuspids and premolars is known as the _____.
 - Leeward space
 - Leeway space
 - Maintained space
 - none of the above
- If there is early loss of a primary molar and the first permanent molar has erupted, maintaining the space as soon as possible will _____.
 - create extra space for wisdom teeth
 - prevent eruption of permanent premolars
 - prevent the first permanent molar from drifting mesially
 - none of the above
- The unilateral space maintainer should be used in _____.
 - very young children who have lost a single primary posterior tooth
 - very young children when you are sure the successor tooth will not erupt for many years
 - children whose permanent bicuspid has already erupted
 - a plus b
- When evaluating space in the mixed dentition, the _____ should be evaluated.
 - sufficiency of Leeway space
 - amount of mandibular crowding
 - amount of anterior maxillary spacing or crowding
 - all of the above
- The Tanaka and Johnston method will overestimate the required space for _____ females.
 - Caucasian
 - African-American
 - Chinese
 - all of the above
- The lower lingual holding arch is readily used _____.
 - in the fully erupted permanent dentition to maintain the Leeway space
 - in the mixed dentition to maintain the Leeward space in children with severe crowding
 - in the mixed dentition to maintain the Leeway space in children with mild to moderate crowding
 - none of the above
- The transpalatal arch is used _____.
 - in the maxillary arch as a bilateral space maintainer
 - in the maxillary arch as a unilateral space maintainer
 - in the mandibular arch as a bilateral space maintainer
 - a and c
- The addition of a Nance button to a maxillary appliance _____.
 - prevents distal movement of the maxillary molars
 - prevents mesial movement of the maxillary molars
 - prevents tongue thrust
 - all of the above
- The three categories of _____ are the fixed-functional, fixed-static and removable.
 - anterior space maintainers
 - posterior space maintainers
 - lateral space maintainers
 - all of the above
- According to the authors, the Groper appliance is the best appliance for _____.
 - missing posterior teeth in arches that need arch development
 - missing anterior teeth in arches that need arch development
 - anterior space maintenance in arches that do not need arch development
 - a and b
- Removable-functional appliances are used when _____.
 - arch development is needed
 - arch development is not needed
 - the patient is noncompliant
 - none of the above
- Hawley appliances are examples of _____.
 - fixed appliances
 - removable-static appliances
 - removable-functional appliances
 - none of the above
- One of the most common causes for delayed eruption of a single tooth when the contralateral tooth has erupted is _____.
 - heredity
 - reduced force
 - earlier trauma to the region
 - none of the above
- _____ can be used to facilitate movement after surgical exposure of an erupted tooth.
 - A bonded button
 - Some elastic force
 - A grooved area
 - a and b
- Retained primary teeth _____.
 - can be left in place until they eventually exfoliate
 - need to be extracted to allow for eruption of the permanent successors
 - are of no consequence
 - none of the above
- The most common place for supernumerary teeth is _____.
 - the mental region of the mandible
 - adjacent to the submandibular salivary glands
 - the maxilla
 - all of the above
- Children's habits can _____.
 - alter tooth positions and skeletal development
 - alter tooth development and skeletal positions
 - fix tooth development and skeletal positions
 - any of the above
- In undiagnosed airway obstruction in children, _____.
 - the jaws can grow narrow
 - the muscles of the face constrict the jaw
 - the patient may exhibit restlessness and irritability
 - all of the above
- Tongue position problems and tongue thrust can cause _____.
 - anterior crossbites
 - anterior open bites
 - posterior crossbites
 - all of the above
- When using a fixed tongue crib, the problem has usually been resolved after wearing the appliance for _____.
 - two to three months
 - three to six months
 - six to eight months
 - nine to twelve months
- Digit habits are best solved by _____.
 - using removable appliances
 - using fixed bonded appliances
 - using bitter aloe
 - none of the above

Diagnosing Early Interceptive Orthodontic Problems — Part 1

Name: _____ Title: _____ Specialty: _____
 Address: _____ E-mail: _____
 City: _____ State: _____ ZIP: _____ Country: _____
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Requirements for successful completion of the course and to obtain dental continuing education credits: 1) Read the entire course. 2) Complete all information above. 3) Complete answer sheets in either pen or pencil. 4) Mark only one answer for each question. 5) A score of 70% on this test will earn you 2 CE credits. 6) Complete the Course Evaluation below. 7) Make check payable to PennWell Corp. **For Questions Call 216.398.7822**

Educational Objectives

- List and describe normal growth and development of the dentition and its phases.
- Describe the early treatment examination and list the records that are required for this examination.
- List the factors and potential problems to consider during the early treatment examination.
- List and describe the fixed and removable appliances that can be used as space maintainers and habit breakers during the mixed dentition phase.

Course Evaluation

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

1. Were the individual course objectives met?	Objective #1: Yes	No	Objective #3: Yes	No		
	Objective #2: Yes	No	Objective #4: Yes	No		
2. To what extent were the course objectives accomplished overall?	5	4	3	2	1	0
3. Please rate your personal mastery of the course objectives.	5	4	3	2	1	0
4. How would you rate the objectives and educational methods?	5	4	3	2	1	0
5. How do you rate the author's grasp of the topic?	5	4	3	2	1	0
6. Please rate the instructor's effectiveness.	5	4	3	2	1	0
7. Was the overall administration of the course effective?	5	4	3	2	1	0
8. Do you feel that the references were adequate?		Yes		No		
9. Would you participate in a similar program on a different topic?		Yes		No		
10. If any of the continuing education questions were unclear or ambiguous, please list them.	_____					

11. Was there any subject matter you found confusing? Please describe.

12. What additional continuing dental education topics would you like to see?

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P.O. Box 116, Chesterland, OH 44026
 or fax to: (440) 845-3447

For IMMEDIATE results,
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| 13. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 28. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
| 14. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 29. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D |
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