

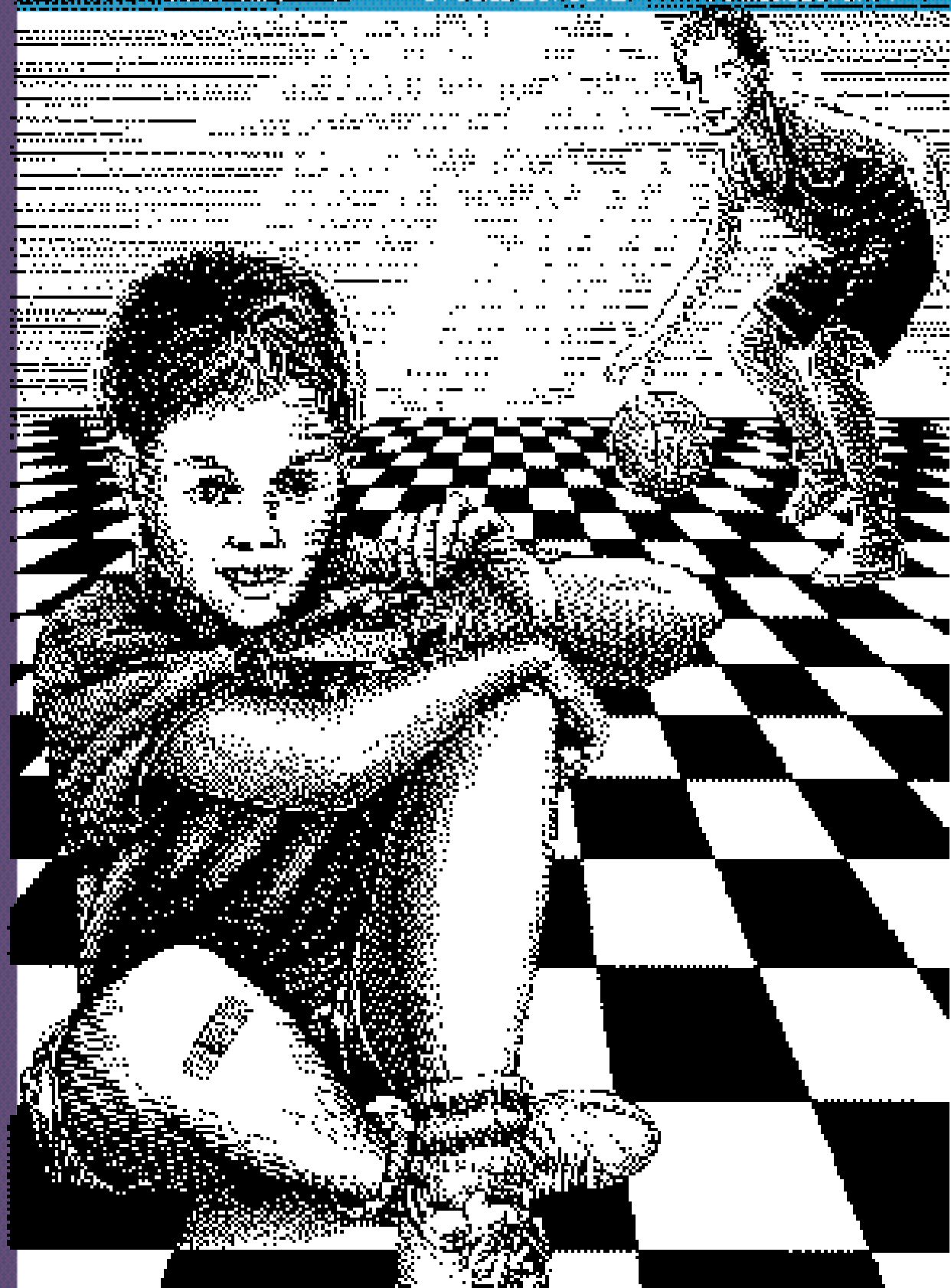


American Association of Orthodontists

VOLUME NINE

NUMBER ONE

SUMMER 1997



ORTHODONTIC DIALOGUE

ORTHODONTIC TREATMENT

IN THE MIXED DENTITION

Orthodontic treatment in the mixed dentition

"I'd like my daughter's braces done now so we don't have to deal with it at age 13." Orthodontists, pediatric dentists, and general dentists have all heard this before. Orthodontic clinicians know, however, that most patients who receive orthodontic care in the mixed dentition will need a second phase of treatment in the permanent dentition. Whether to render treatment in the mixed dentition requires careful case selection and a thorough diagnosis and treatment plan.

The mixed dentition is the developmental period after the permanent first molars and incisors have erupted, and before the remaining deciduous teeth are lost. Phase I treatment is usually done early in this period. The American Association of Orthodontists recommends all children should see an orthodontist by age 7. A favorably developing occlusion at this stage has these characteristics¹:

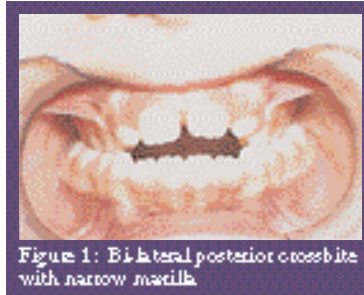
- The molar relationship is usually end-on (slightly forward of Class I), and typically transforms into a Class I during the transition from the mixed to the permanent dentition.
- Nicely aligned permanent incisors, often still sporting their mammelons, with rather short clinical crowns, and a 1-3 mm overbite and overjet.
- There will often be a small space either mesial or distal to the primary canines.

Jaw growth

Jaw growth affects orthodontic treatment, usually favorably, but sometimes unfavorably. When and how much growth will occur is completely unpredictable. However, we know some useful facts about jaw growth in the mixed dentition²:

- Between the ages of 5-10 years, the inter-canine dimension may increase by 3 mm (on the average).
- After the age of 10, there are no width increases.
- The space in the maxillary arch (from molar to molar, traced through the contact points) increases by an average of 2 mm. The change in the mandible varies from a decrease of 2 mm to an increase of 4 mm.

- The palatal midline suture closes at about the age of 13 in girls, 16 in boys.
- The fronto-palatal suture closes at around age 2.
- The mandible is a single bone (no sutures) after the age of one.
- Growth rates peak for girls at age 13, boys at age 15.



An interesting feature of dental development is the leeway space³ (extra space under the primary second molars). The primary second molars are often larger than the underlying second bicusps. During the transition to the permanent dentition, this space is liberated. This may provide some extra space, however, in many patients it is lost as the permanent first molars drift forward to take up the slack.

Treatment strategies

Mixed dentition treatment goals often focus on skeletal rather than dental correction. To design a treatment plan, the clinician must understand the growth and development patterns, and the known effects of the chosen treatment modality.

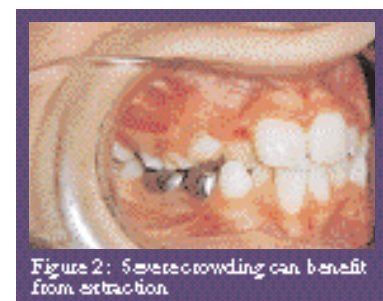
Skeletal problems

Three common skeletal problems are the protrusive, retrusive, or very narrow maxilla.^{4,5} The protrusive maxilla and dentition can be affected by distal forces placed on the upper teeth.⁶ An example of this is the use of bonded or banded attachments on the upper molars and incisors along with a headgear. If the force levels are about one pound per side, and the patient uses the appliance 10-12 hours per day, two things will happen. The upper teeth will be moved distally within the maxilla, and the maxilla will be shifted distally on its sutures.^{7,8} With the neckband, the force vector is down as well as back, so the upper molars may also extrude. This can tip the upper occlusal plane down in

back, increasing the lower facial height, measured from nose to chin. This response is appropriate for the patient who has an average or short lower face height, but not appropriate for the patient with a long lower face height.

The retrusive maxilla can be brought forward if appropriate forces are applied to the maxillary dentition. An example of this is the use of a fixed expansion device on the upper buccal segments, with hooks to accept elastics from a forward-pull headgear. We know such appliances will slip the maxilla forward on its sutures. This is best done at an early age, as more sutures are open.⁹

The narrow maxilla is often associated with a posterior crossbite¹⁰ (figure 1). You may see the mandible shift out of centric relation laterally toward the crossbite side. This problem may cause enamel wear or stress on the TMJ and facilitate asymmetrical growth. The treatment is likely to involve expansion of the maxilla at the suture. Mandibular skeletal problems are complicated by the fact that the mandible has no sutures. Growth occurs at the condyle, and by surface apposition. We do not know how to make a short mandible grow significantly more. Researchers have studied functional appliances (activator, bionator, Frankel, Twin-block), and can demonstrate only 1-2 mm more mandibular growth than control groups.¹¹ We do not



know if such effects are permanent. We also don't know how to make a long mandible grow less, or how to make an asymmetrical mandible straighten out. When such problems are severe, the clinician will often delay treatment until growth is complete, and consider surgical/orthodontic correction.

Since the mandible cannot be widened through sutural expansion,

our ability to create space is limited. There is no research to show that we can expand the mandibular dental arch more than 3-4 mm with permanent results.¹² Therefore, treatment strategies for crowding in the mixed dentition focus on saving the leeway space under the deciduous second molars, mild expansion, or serial extraction of first bicuspid teeth (figure 2).

Dental problems

Many dental development problems can be headed off in the mixed dentition; for example, anterior crossbites (figure 3). In-time removal of a deciduous tooth could prevent a crossbite, but once the permanent upper incisor is caught on the lingual of the lower incisors, treatment is needed. The anterior crossbite can cause tissue damage around the affected lower incisor.

Another example is the displaced lower midline as a result of the early loss of a lower deciduous canine. Removal of the opposing canine may cause spontaneous correction of the midline. Delayed exfoliation can have a negative effect as well. The succedaneous tooth may become seriously



displaced or impacted.

A panogram will reveal many aberrations of dental development, such as missing teeth, supernumerary teeth, impactions and displaced teeth.

Ankylosis of primary molars is a common finding in the mixed dentition. If the tooth is moderately submerged, leave it to exfoliate on schedule. A severe ankylosis can cause retardation of alveolar height or tipping of adjacent teeth.

Digital sucking habits are common in the mixed dentition. It is best to help the patient discontinue the habit around age 5 or 6. The use of a removable appliance may be effective (figure 4).

Another dental condition that deserves attention is TMD. Symptoms appear in some patients, and can be diagnosed and treated as with older patients.

Anomalies

Cranio-facial anomalies present some challenging skeletal discrepancies. Most patients with facial deformities (cleft palate, suture formation abnormalities) should be supervised by a cranio-facial panel of experts. These panels are typically associated with a children's or university hospital and will include a psychologist, plastic surgeon, oral surgeon, orthodontist, speech therapist, etc.

The late mixed dentition

The transition period when the deciduous molars and canines are exfoliating is often called the late mixed dentition. This is the classic period to place a lower lingual arch to save extra space under the deciduous second molars.^{13,14} Some clinicians advocate starting comprehensive orthodontic treatment during this period. It gives you a head start on Class II correction in girls. Normalizing jaw relationship as the teeth erupt may guide them into better occlusion, thus simplifying the treatment. The downside of starting treatment at this age is extended treatment time. With some patients, the final eruption of the second molars may be a couple of years after the late mixed dentition.

Controversy

The two areas that remain controversial in the orthodontic literature are treatment of crowding and of Class II malocclusions in the mixed dentition. Is there a benefit to early treatment for these problems? This question has yet to be fully answered by research.^{15,16,17,18}

In the case of crowding, the clinician should at least supervise the development of the problem. Crowding can be disfiguring; a family may want early correction. It can lead to tissue recession, midline displacement, crossbite, or severe wear of incisal edges. The clinician may recommend early removal of deciduous teeth to delay the effects of the problem, or of permanent teeth to allow spontaneous improvements. If permanent teeth are removed early (as in serial extraction of first bicuspid),

the dental alignment can improve dramatically. However, the timing of the extractions has a potent effect on the amount of spontaneous improvement, so the clinician must be familiar with the limits and indications of this maneuver.¹⁹ In almost every case, the serial extraction procedure is followed by comprehensive orthodontic treatment in the permanent dentition with fixed appliances.



Removal of permanent teeth is less controversial than expansion to provide room because research that supports expansion of the dental arch is lacking.¹²

Early correction of the Class II maxillary protrusion can be valid in some cases. We know that very protrusive teeth increase the risk of traumatic injury. We can usually expect better cooperation with headgear appliances when the patient is in the preteen years. Gender is also an issue. Many girls' facial growth is slowing down as the permanent teeth erupt. This limits the clinician's ability to use growth as an ally to correct the problem. While most clinicians utilize the above principles in deciding whether or not to undertake a Phase I treatment, there remains conflicting evidence that treatment of mild-to-moderate Class II problems is worthwhile.¹⁵

Final thoughts

The AAO recommendation to provide orthodontic screening or referral by age 7 is well-founded. The orthodontic clinician can diagnose and intercept certain developing problems with early treatment. Many other cases should be supervised, but not treated until the permanent teeth are in place. We must base our decision to treat on experience, knowledge of growth and dental development, and research.

The American Association of Orthodontists is a national dental specialty organization that was founded in 1900. The AAO comprises more than 12,000 members. Among its primary goals are the advancement of the art and the science of orthodontics; the encouragement and sponsorship of research; and the achievement of high standards of excellence in orthodontic instruction, practice and continuing education.

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