Which malocclusions would benefit from some form of early treatment is a frequent topic of sometimes-heated debate. With his dual training in periodontics and orthodontics, Dr. David Kennedy, the interviewee for this issue, brings a good deal of knowledge and expertise to this controversial issue and supports his views with references from the referred literature. His experienced insights provide valuable direction in terms of early treatment procedures for our younger patients.

Terry McDonald: How do you determine which cases are suitable for early treatment?

David Kennedy: I ask myself three questions when considering early treatment.

- Can I treat the problem permanently?
- Will early intervention make future treatment easier?
- Is something harmful occurring that treatment can reduce or eliminate?

With early treatment, there is a long period before we know whether the intervention will succeed. Conceptually, I want to provide short-duration early treatment in order to reduce patient fatigue and costs and avoid exhausting the patient’s insurance coverage. Another issue I try to avoid is using braces twice. Therefore, my Phase I treatment involves appliances such as headgear, functionals, expanders, lingual arches, retainers and fixed or removable space regainers. When braces are used in Phase I and again in Phase II, parents sometimes assume that the Phase I was not done correctly.

TM: Which malocclusions absolutely should be treated early?

DK: In my opinion, the presence of a crossbite, either posterior or anterior, is an indication for early treatment. In the transverse plane of space, the posterior crossbite is usually due to maxillary constriction. Studies demonstrate 84% long-term success of early expansion in correcting posterior crossbites, regardless of which appliance is used. We use a fixed appliance in the young child (under 10) with slow maxillary expansion (a quarter turn every two days) since the sutural biology does not require the high forces associated
with rapid expansion. Over-expansion is needed because approximately 25-33% of the initial expansion is lost.¹

Longer retention of the initial expansion and expanding at a younger age provides a greater inter-molar width long-term. Therefore I leave the fixed expansion appliance in its own retainer for nine months after the initial expansion.

The anterior crossbite also benefits from early treatment but requires that the clinician differentiate between dental and skeletal causative factors. Non-skeletal single tooth anterior crossbites are frequently related to maxillary anterior crowding and often result in gingival recession on the corresponding lower central incisor. These cases are best corrected as soon as possible so as to curtail further periodontal damage.

I find that I can correct anterior dental crossbites in four months or less with removable retainers. Spontaneous improvement in both the lower incisor alignment and the gingival recession usually results when the crowding is relieved and the crossbite corrected. Limited or no retention is needed provided there is a positive vertical overbite. I re-evaluate the need for periodontal grafting post crossbite correction.

Class III skeletal malocclusions warrant consideration for reverse pull headgear. Just as a deficient mandible often results in a Class II malocclusion; similarly maxillary deficiency rather than mandibular excess frequently underlies the Class III cases. A review of family history along with clinical and cephalometric assessment can help determine whether the patient is likely to develop mandibular excess. A family history of mandibular excess, the presence of asymmetry, an unfavorable cephalometric Wits analysis and a measurement of AB to mandibular plane of less than 65 degrees all indicate potential problems with future growth progress.

A random clinical trial has shown that maxillary expansion prior to facemask treatment yielded no improvement compared to absence of maxillary expansion.² Therefore expansion is recommended only in cases of transverse deficiency. Patients wear the reverse pull headgear 12 hours per day. I find two-thirds of these patients treatable non-surgically in the permanent dentition. Occasionally this type of Class III early treatment does need to be repeated in the late mixed dentition.

**TM: What do you do about developing tooth size arch length deficiency (TSALD) for the growing child?**

**DK:** In cases of minimal crowding (under 6mm) where we are planning non-extraction treatment, we focus on managing the mandibular leeway space. We follow mesial interproximal reduction of the mandibular primary canines with reduction on the mesial of the primary first molars. This assists in relieving the developing anterior crowding. A lower lingual arch is then placed near the end of the mixed dentition which can preserve as much as 5mm of leeway space, depending on the size of the second premolars. Two-thirds to three-fourths of patients with 6mm or less of lower crowding can have it corrected by the judicious use of a lingual arch in the late mixed dentition. This modality of treatment also provides better long-term incisor stability than does incisor proclination.⁴²

It is appropriate to consider serial extraction when crowding is extensive. This procedure is recommended for 8mm or more of crowding and/or bi-maxillary protrusion and/or a malocclusion requiring bite closing mechanics.

The classic serial extraction protocol starts with primary canine extraction as lateral incisors erupt. In order to accelerate first premolar eruption, removal of the first primary molars at age 9 to 10 follows, and then the removal of the first premolars on eruption. This approach results in three separate surgical interventions for the child in all four quadrants. As a practicing pediatric dentist for many years, I have learned that children and their parents count the teeth that are extracted (regardless of the fact that many would have exfoliated anyway). They also remember the number of times they had local anesthetic.

My approach reflects my pediatric dentistry experience, which has led me to minimize the numbers of surgical inventions for myself as well as the child. I therefore bypass the primary molar extraction and extract or enucleate first premolars if the eruption sequence is unfavorable—that is, when permanent canines erupt ahead of the first premolars). This approach reduces the numbers of extractions and surgical interventions.
When serial extraction patients are compared to late premolar extraction cases, the Par Index is 15 for the serial extraction cases reduced from 32 for the late premolar extracted cases. This usually means reduced treatment time for the serial extracted cases. Patients who undergo serial extraction are also usually better off periodontally since this allows cuspids to erupt into attached tissue.

I use space maintainers with serial extraction in two circumstances, one in the mandible and one in the maxilla. In the mandible, when there is a steep mandibular plane with significant crowding. When premolars are extracted to resolve canine crowding, the permanent molars must be held to prevent mesial drift due to the steep mandibular plane. The lingual arch also helps control vertical molar eruption. I like to place the Nance lingual arch when the patient has a mild Class II malocclusion. With extraction of first premolars and exfoliation of lower second primary molars, the maxillary molar must be held back with a Nance appliance. This prevents upper molar mesial migration, encourages lower arch mesial drift to obtain some spontaneous Class II molar correction, and also holds upper extraction space for future Class II correction. More severe Class II crowded cases call for headgear in the mixed dentition for molar distalization and/or growth modification.

Some clinicians claim to manage crowding in the mixed dentition with arch development, but evidence tells us that posterior arch expansion yields only 0.66 mm of arch perimeter gained from each 1 mm of lateral expansion. Most often the arch length gain occurs by lower incisor proclination and/or an increase in intercanine width, both being notoriously unstable. The greatest relapse takes place when arch development occurs in the mixed dentition and therefore it is not recommended.

**TM: What other problems do you supervise or treat in the mixed dentition?**

**DK:** Two areas are habit correction and eruption guidance. Early crib treatment for openbites is approximately 82% successful in keeping an openbite closed in the permanent dentition. I see the best long-term outcomes with earlier crib treatment and using a “spike” form of crib.

I define eruption guidance as the management of asymmetric or unusual eruption problems. We therefore treat ectopic molars and incisors, as well as preventing ectopic eruption of permanent canines, by appropriate extraction and space opening. Unusual angulation of an upper lateral incisor and lack of mobility of the adjacent primary canine at around age 10 generally indicates radiographs to diagnose the possibility of ectopically positioned maxillary canines. Depending on the level of ectopia, primary canine extraction can result in significant self-correction. In severe cases, surgical uncovering is appropriate. Dr. Vince Kokich covered this topic in a previous PCSO Bulletin interview.

Patients with missing lateral incisors show a higher frequency of palatal ectopic canines. When a child has missing upper laterals, the upper primary canines are extracted around age 10 so that the permanent canine erupts mesially. With canine substitution, this gives the best outcome. Where the canine will be moved distally and the missing lateral replaced with an implant, the mesial migration of the permanent canine brings bone with the passive mesial eruption. Then, when the canine is retracted to Class I, that bone remains, resulting in a robust implant site.

**TM: What is your philosophy about Class II treatment?**

**DK:** Random clinical trials have shown that while Phase I Class II treatment can effect changes, the early treatment does not necessarily reduce the Phase II treatment time. Nor does it lessen the need for extractions or surgery. Delaying treatment until later is more efficient in terms of overall treatment time, fewer absences from school and cost control. In my opinion, there are two reasons for starting Class II correction early. One is when the patient is extremely accident-prone, and has protrusive maxillary incisors. The second reason is psycho-social, where children are distressed by their appearance and compromised in their social development. In those cases, I will begin the Class II correction treatment in the early mixed dentition to get the incisors back out of harm’s way, attain lip coverage and address the psycho-social issues.

For most Class II cases, I intervene in the late mixed dentition and have found headgear compliance good when children are
10 and 11 years old. In mildly crowded cases, I start treatment with a lingual holding arch to preserve leeway space and use a headgear 12 hours per day to distalize the molars. This also may resolve minor upper crowding.

We usually over-correct the molars to Class III, and then trans-septal fiber pull encourages the premolars to erupt into a Class I position. One of my primary Phase I treatment goals is to simplify the Phase II treatment, which becomes only alignment and detailing if the Class II is corrected early. If the patient is severely crowded and requires serial extraction but is Class II, we use headgear in Phase 1.

Upper premolar extraction with the lower arch non-extraction is the best treatment for some Class II molar relationships. We often find these in girls with skeletal Class I and dental Class II. Frequently maxillary primary canines have been extracted or lost early, which relocates the crowding to the permanent canines. Judicious extraction of maxillary first premolars resolves upper crowding. I avoid this in boys because late mandibular growth can haunt you with their late Class III development.

Growth modification for Class II is often required at a younger age in females than males. I use headgear/twin block combination for mandibular retrusion. When compliance is poor, we will use the Forsus appliance. A crossbow appliance can give good dental correction in the mixed dentition. For non-skeletal Class IIIs that require non-extraction treatment, a Pendulum or Distal Jet appliance can correct the dental Class II molar to super Class I. Molars are then held back with a Nance appliance, and the premolars and canines are retracted to Class I. Although effective, this modality of treatment can result in quite lengthy treatment.

**TM**: Thank you, Dr. Kennedy.

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Dr. Kennedy currently practices orthodontics and resides in Vancouver, BC. He is an associate clinical professor and co-clinic director in graduate orthodontics, faculty of dentistry at the University of British Columbia there. He has published more than 40 articles, taught more than 50 courses and delivered more than 100 lectures.

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