Missing Second Premolars:
Can Early Treatment Make a Difference?

Presented by David Kennedy, BDS, MSD, FRCD(c) at the PCSO Annual Session, October 25, 2009.
Summarized by Dr. Bruce P. Hawley, PCSO Bulletin Northern Region Editor.

The orthodontist often identifies missing second premolars in the mixed dentition using a routine panoramic x-ray. In many cases, comprehensive diagnostic records are essential to evaluate the patient in all three planes of space, establish a problem list and treatment alternatives, and finally come up with an informed consent approach relative to the available alternatives. The clinician will consider the overall occlusal relationships, the status of the primary second molar crown and roots, presence of ankylosis, the restorative status and alveolar support.

The clinician should ask himself three critical questions to help finalize the decision as to whether the primary second molar without permanent successor should be retained or extracted and whether space opening, managed space reduction or closure is best:

1. What would you do if the absent tooth were present?
2. Can the malocclusion be satisfactorily treated with an extraction and space closure approach?
3. What is the likely long-term survival of the primary molar?

GENERAL CONCEPTS

Dr. Kennedy described four main principles in successfully managing missing second premolar cases:

- establish the correct amount of space
- preserve the occlusal table
- preserve the alveolar ridge
- set up treatment in such a way that the incisors will be in the correct positions at the end of treatment.

In general terms, patients with minimal crowding, deep overbites, retrusive incisors, decreased lower facial height and flat mandibular plane angles are typically best managed nonextraction. In such cases, provided there is sufficient root support and absence of infraocclusion, retain the primary second molars for as long as possible. Patients with greater amounts of crowding, molar or midline asymmetries, protrusive tendencies, minimal overbites or anterior open bites, and increased anterior facial height are frequently best managed with extractions and space closure. In such cases, one is likely to remove the retained primary molar. If you decide to retain the molar, attend to the quality of occlusion and alveolar bone with the goal of the best environment for final restoration. If you propose to close the edentulous space, be sure the incisors remain in good position to provide good facial balance.

Missing second premolars and retained primary second molars are more common in the mandible vs the maxilla. Ankylosis-related infraocclusion is more likely in the mandibular arch. If the primary molar lasts to adulthood without root resorption or submergence, the prognosis is frequently quite good. Root resorption tends to be progressive. If you note resorption of the primary molar root at a young age, the prognosis for long-term retention is less favorable. Tipping of the teeth adjacent toward an ankylosed primary second molar can be a significant problem, and Dr. Kennedy recommends not letting the infraocclusion go past the point of proximal contact. In these cases, the primary second molar should be removed, since if left unattended there could be a long-term vertical bone height compromise, and later extensive surgical removal could also compromise bony support. Typically with extraction, the vertical alveolar ridge is adequate for later implant placement, because compensatory eruption of the adjacent permanent first molar and first premolar coincident with skeletal growth carries the interproximal bone occlusally. As there is only 25% buccolingual ridge width loss in the first three years following removal of a mandibular primary second molar and only 4% loss after this time (with most loss occurring on the buccal aspect), future placement of an implant is typically not compromised. Newer socket site enhancement techniques such as placement of coral granules in the primary molar extraction site have shown greater than 90% success in preserving the alveolar process, so that implants can be placed later without the need for a bone graft.
COST CONSIDERATIONS
In general, orthodontics to close an edentulous premolar space is more cost effective and is more periodontally healthy an approach than prosthetics. When a space closure treatment plan is taken with permanent teeth missing, the patient incurs the cost of the orthodontic treatment alone. When spaces are left open and the primary second molar either has been lost or is expected to be lost and replaced prosthetically, the patient then incurs the cost of orthodontic treatment, any preprosthetic procedures, the restorative replacement and future maintenance of the restorations. This increases with greater numbers of congenitally absent teeth. Dr. Kennedy is therefore of the opinion that whenever possible, priority should be given to space closure treatment plans to maximize improved periodontal health as well as reduced overall long term cost.

Dr. Kennedy presented a number of case histories to illustrate the variety of treatment options available for managing missing second premolars in the growing patient. For each case, the clinician should ask himself the three questions stated at the beginning of this review.

RETAINED PRIMARY MOLAR, DISC AND BUILD UP AS NEEDED
In a nonextraction treatment plan, typically interproximal reduction of the primary second molar tooth surfaces is necessary to make the tooth width comparable to that of the absent second premolar. If there is minimal submergence of an ankylosed lower primary second molar and there is limited anticipated future growth, then restorative composite buildup of the occlusal surface can maintain the integrity of the interproximal contact and prevent supraeruption of the opposing teeth and the tendency for the adjacent teeth to tilt toward the primary tooth crown. Failure to reduce the mesiodistal width of the retained primary molar typically results in an end on Class II molar relationship despite a Class I canine occlusion. Alternatively, one can leave some extra space in the upper arch in order to attain both a Class I molar and canine occlusion.

EXTRACT RETAINED PRIMARY MOLAR, MAINTAIN SPACE AND RESTORE PROSTHETICALLY
If a nonextraction approach is indicated but there is significant ankylosis or root resorption of the primary second molar, then it should be extracted and the space managed for future prosthetic replacement. In many cases, fixed space maintainers are not needed, and frequently the adjacent molar and first premolar will erupt towards one another. Moving these teeth apart in later orthodontics has the advantage of building a broad base of alveolar bone to accept an implant. In the growing individual, a temporary immediate restoration could be a Maryland bridge, a removable partial denture or retainer, or a bonded wire retainer. The placement of implant supported crowns can following the confirmed cessation of facial growth by serial headfilms. The availability of temporary anchorage devices now sometimes gives us other options to close spaces when in the past it was virtually mandatory to maintain.

EXTRACT THE PRIMARY SECOND MOLAR (S) AND IF NECESSARY OTHER PREMOLARS AND CLOSE THE SPACES IN EARLY PERMANENT DENTITION
If rendered sufficiently early enough and on the right patient, often much of the space will consolidate autonomously, through “drifodontics.” Often times this can leave relatively minimal space to manage in fixed appliances and in turn little to no incisor retraction. In Class II malocclusions, the extraction of maxillary first premolars (assuming that the maxillary second premolars are present) and the retained mandibular primary second molars without successors can result in a camouflage approach to managing the overall malocclusion. This may not be possible where there is minimal crowding present. TADs can sometimes be used to facilitate mandibular molar protraction, reducing the tendency for incisor retraction but increasing patient cost.

EXTRACT PRIMARY MOLARS IN THE MIXED DENTITION AND CLOSE THE SPACES/MODIFIED SERIAL EXTRACTION
Patients with crowding and/or midline discrepancies can sometimes be managed with extraction in one arch or quadrant, with other extractions rendered much later in time. Sometimes space maintainers are indicated. Class I cases without crowding, with absence of second premolars and removal of all primary second molars, show 80% of mandibular extraction spaces and 90% of maxillary extractions spaces closed at four-year follow-up. This leaves on average less than 1mm of maxillary and 2mm of mandibular space to close, with a somewhat greater degree of tipping of the lower first molar and first pre-
molar in comparison to the uppers. This space closure occurs without incisor retraction and with drifting of the posterior dentition mesially. Such early aggressive space closure treatment plans not only can eliminate the need for future prosthetics but can reduce the length of time in fixed appliances.

SEQUENTIAL SLICING OF THE PRIMARY SECOND MOLAR, FOLLOWED BY HEMISECTION, EXTRACTION, AND SPACE CLOSURE

Sequential distal interproximal reduction of the primary second molar, with the goal of having less distal drifting of the first premolar and relatively more mesial migration of the permanent first molar (in comparison to extraction of the primary molar), may result in less tooth tipping but requires repeated interventions on the child patient and has not been proven to be better statistically. Hemisection of primary second molar in permanent dentition patients and later extraction of the primary molar have shown relatively little facial flattening in comparison to conventional premolar extraction patients with more crowding.

TRANSPLANTATION

One instance of considering an autogenous tooth transplant could be a case exhibiting crowding along with missing teeth. If premolar tooth extractions are being considered for management of crowding in one arch and there are congenitally absent teeth in the opposing arch, then a transplant could be made from one arch to the other. Another option with missing mandibular second premolars in a Class II situation could involve transplanting two maxillary premolars (assuming that all maxillary premolars are present) to the lower primary second molar sites. Future orthodontics would then treat to a Class I canine and Class II molar relationship. Transplants are surgically sensitive in technique and are most successful with teeth having two-thirds to three-quarters root formation (i.e., with open apices). A 92% ten-year success rate has been reported for transplants. Remember that transplants typically do not have the periodontal challenges that are often encountered with implants over time.

SUMMARY

Dr. Kennedy emphasized two major principles in the management of the growing child with missing second premolars. In the non-extraction approach the orthodontist needs to establish the proper amount of space for the missing tooth without compromise to the alveolar ridge. In the extraction treatment plan, the lower incisor position should not be compromised.