Hemisection:
Facilitating the Orthodontic Correction of Congenitally Missing Lower Second Premolars

by William Northway, DDS, MS
Private Practice
Traverse City, MI

Educational objectives

Upon completion of this course, participants should be able to achieve the following:

a) Understand the advantages of space closure and how to make it easy.
b) Understand the biometric disadvantages that accompany agenesis of a lower second premolar.
c) Grasp the biological complications that can be avoided with attention to process and timing.
d) Save their patients the cost and disadvantages of a prosthesis instead of a natural tooth.
e) Approach the problem with an appreciation for an aesthetic result, one that respects facial fullness while solving the partial edentulism.

Years ago, while attending a lecture with Dr. Robert Moyers in which the speaker presented beautifully treated cases whose principle feature was that the lower second premolars had been removed, Dr. Moyers extolled the quality of the results being shown. He related that, in his experience, you could palpate the alveolar "ditch" mesial to the molar blind-folded. This subject came up in a subsequent conversation with Dr. Frans van der Linden who suggested that the concept of hemisection might be employed. His method involved cutting the second primary molar in half, removing the distal half, so that the lower first molar could migrate into the extraction site. He pointed out that the alveolar collapse would be diminished, facilitating the closure of the space. As I have used this approach over the years, I have progressively improved my mechanics making space closure less complicated. I have found ways to reduce the treatment time. And my approach has evolved to the point where I have much more predictable control over the outcome of the case.

Our 2004 article in the *Angle Orthodontist*[1], demonstrated that space closure could be accomplished without compromising facial profile, and that this is a predictable and consistent outcome. A case with agenesis of the lower right second premolar is treated. In a subsequent article[2], we focus more clearly on the technique.

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Let's suppose that Susie comes in to your office for an exam. She has no real caries problem. She is eight years old and presents an excellent profile and a normal occlusion, but her radiographs reveal a congenitally missing lower second premolar (CML5). How do you treat it?

So far this tooth shows no signs of ankylosis and the roots appear to be normal. What are the chances that the tooth could be left in place and still be a suitable functional unit for life? Sletten contends that the potential for retaining the primary second molars for many years is excellent among adults who present with that condition.[3] The problem is that, in order to find 20 adults who had healthy second primary molars, they had to go through 6,000 case records. That means that 0.3 percent of their sample has a chance of keeping their primary molar. Van der Linden[4], Grahnen[5], and Markovic[6] have demonstrated that the incidence of CML5 is about four percent. Simple calculation then reveals that about 7.5 percent might be well served by the decision to maintain the primary molar.

Bear in mind that, in order to make a retained second primary molar fit into a good scheme of occlusion, you will need to reduce the mesial and distal contacts to a point that will require restoration; and what happens if the tooth is one of those that will ultimately fail? You could extract the primary molar and transplant a third molar into the site; or you could go to the expense of placing a bridge or implant. However, if the patient will need orthodontics for any other reason, why not just extract and close the space?

It should be borne in mind that the absence of a lower second premolar correlates strongly to other biometric phenomena: there is a good chance that the lateral incisors and other teeth will be small.[7] Baccetti recognizes these attributes as being "developmental" as opposed to "positional" anomalies. Positional issues such as failures in eruption of first and second molars, palatally displaced maxillary canines, infraocclusion of primary molars, and rotated maxillary lateral incisors all correlate strongly. Among individuals with agenesis there is also the likelihood that facial fullness will be compromised.[8,9] It has been our experience that many of the patients who suffer CML5 also have transverse discrepancies and need palatal expansion.

Seldom has it been my experience that cases with CML5 also present a great deal of anterior crowding; such a condition would make orthodontics and space closure an easy choice. But in cases like the one we are describing, I have found that the procedure of hemisection has been a very effective weapon in predictable correction.

Let's say the decision is made to close the space; once the lower second primary molar is extracted, the space begins to close. However, the buccolingual alveolar width begins to collapse at the same time. While Ostler[10] shows that there is only a 25 percent reduction in the first three years, my experience is that it happens much more rapidly than that. Admittedly, this can be influenced considerably by the care that is shown to the extraction site during the extraction. The critical consideration is that the reduction is actually demonstrative of the buccal and lingual invagination of the alveolar ridge, compromising one's ability to be able to drag the molar forward in an effort to close the space. Now, if one's intention is to place an implant, the reduction of a couple of millimeters of alveolar width might not be critical, but this will severely compromise orthodontic opportunities. Protraction is the objective if the hope is that space closure will not result in a retraction of the incisors which might lead to a flattening in facial profile.

Our approach to CML5 is to have the lower second premolar cut in half from buccal to lingual; and then the distal half is removed (hemisection is more effective in the lower arch). The pulp chamber of the mesial half is extirpated and the chamber sealed off by a plug of calcium hydroxide paste; there is no need to perform a root canal on the mesial half, because you will want that portion to remain only long enough to preserve the buccolingual width, and to act as a guide for the first premolar. When the mesial root of the lower second primary molar is lost prior to the eruption of the first premolar, the premolar will migrate toward the distal, profoundly compromising your anchorage.

The concept of "mesial drift" does not apply nearly as well in the lower as it does in the upper arch. Considering the dynamics of space closure in the upper arch, hemisection in the upper would be over-kill. On the other hand, if you have ever witnessed the removal of a lower first molar prior to the age of 12, you have likely seen the second premolar drift to the distal, sometimes so much so that the second premolar will leave a considerable space between it and the first premolar – perhaps even making contact with the mesial of the second molar. On the other hand, the removal of the distal half of the second primary molar predictably results in a mesial migration of the first molar, and in a highly predictably bodily fashion. Again, it is worthy of repeating that this procedure also occurs with much less reduction in alveolar width.

Valencia has demonstrated that the earlier that mesio-distal width of the second primary molar is compromised (either through cutting away some of the enamel thickness on either the mesial or distal), the more effective will be the drifting and subsequent space closure.[11] His excellent article depicts a scenario of "good space closure" in 90 percent of the cases where reduction occurs prior to age eight or nine. Of course, complicating the decision is the possibility that the premolar might form late. The likelihood that a lower second premolar will form into a normal tooth is diminished if there is no radiographic image prior to age nine.

At the point where the first molar's continued mesial migration begins to be impaired by the proximity of the remaining mesial half, this residual segment needs to be removed. At that

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time, consideration needs to be given to initiating orthodontics for the purpose of closing the remaining space. Our cases demonstrate that, once this mesial half is removed, the anterior teeth begin to migrate toward the extraction site almost immediately.

Appliances like chin-cups and protraction face-masks might make very effective appliances for the protraction of the posterior teeth. However, we have found that compliance becomes a major complicating factor. We have had considerable success having the patient wear a tooth-borne activator with Class I elastics on the affected side *while the appliance is being worn.* The thinking is that a properly adjusted activator (or perhaps a bionator, a twin-block appliance, or some other functional appliance) causes the mandible to be held forward; the resulting effect on the teeth is that they tend to be proclined. If elastics are applied at the same time that the appliance is being worn and are connected from the lower molar to a hook mesial to the canine, the lower anteriors will be drawn toward the lingual. Properly adjusted, this lingual force will be offset by the protracting effect of the functional appliance. In an ideally adjusted system, the resultant net force then would be one where there is protraction of the posterior teeth exclusively. The problem with this "system" is the limitation in the number of hours that the functional appliance can be worn during any given day.

In order to increase the number of hours of application, we have moved toward other protracting appliances, like a Jasper Jumper or the Forsus appliance. Treatment time can be considerably reduced because of the increased number of hours that result from having the appliance tied in constantly. Similarly, one can use titanium closing springs, reducing the need to rely on cooperation with elastics. Finding a good balance between the protraction of the posterior teeth and diminished retraction of the anteriors will hopefully provide space closure with greater control of the position of the incisors, which will give improved facial aesthetics.

We have tried temporary anchorage devices (TADs) for protraction in these cases, but with very poor results in young children – in our hands. We have found that these have failed to provide the anchorage necessary to close the space while keeping the incisors forward; almost all have worked their way out of the bone. In personal communication with a number of practitioners who have considerable experience with TADs, it is conjectured that the nature of the adolescent alveolar bone (transitional bone) contributes to the rejection in this type of case.

We have also not found the use of primary teeth as anchor teeth to be highly effective. They too will move; and in the process, will adversely influence the position(s) of the underlying permanent teeth.

We find that, when we treat CML5 with hemisection and space closure, we are simultaneously dealing with other orthodontic problems; we have the opportunity to improve – rather than diminish – the fullness of the patient. We have saved the patient the cost of prosthetic replacement; not to mention the inconvenience of having to temporize the patient until their facial dimensions have stopped growing, and an implant can be placed. The fact that the lower second molar so predictably follows the protraction of the first molar – as does the third molar – often means that the cost of removing the lower third molar is alleviated. We feel that the alveolar contour is more natural than that left by any of the other methods used in treating the congenital absence of lower second premolars.

We encourage you to use this concept; and when you do, we hope you will take into consideration the other complicating factors in the treatment of your patient. ■

Bibliography

1. *Northway, W, "Hemisection: one large step toward management of congenitally missing lower second premolars," Angle Orthod. 2004 Dec;74(6):792-9.*
2. *Northway, W, "The nuts and bolts of hemisection treatment: managing congenitally missing mandibular second premolars," Am J Orthod Dentofacial Orthop. 2005 May;127(5):606-10.*
3. *Sletten, W. et al, "Retained deciduous mandibular molars in adults: a radiographic study of long-term changes," AJODO, 124 (6), pp 625-30, 2003.*
4. *van der Linden, Development of the Dentition, Chicago, IL; Quintessence, 1983, 72-3.*
5. *Grahnen, H, "Hypodontia in the permanent dentition, Odontol.Revy, 1956, 7 (suppl #3), p. 1-100.*
6. *Markovic, M "Hypodontia in twins," Swed Dent J Suppl, (1982); 15: 153-62.*
7. *Baccetti, T "Tooth anomalies associated with failure of eruption of first and second molars," AJODO, 2000, 118(6), p 608-610*
8. *Nodal, M., et al. "Craniofacial morphology in patients with multiple congenitally missing teeth," Eur.J.Orthod, 1994: 16: 104-9*
9. *Øgaard,B and Krogstad,O. "Craniofacial structure and soft tissue profile in patients with severe hypoplasia," AJODO, 1995: 108(5): 472-7*
10. *Ostler, S., Kokich, V. "Alveolar ridge changes in patients congenitally missing mandibular second premolars." J ProsthD, 1994; 71(2), p.144-9*
11. *Valencia R, Saadia M, Grinberg G. "Controlled slicing in the management of congenitally missing second premolars," Am J Orthod Dentofacial Orthop. 2004 May;125(5):537-43.*

Author's Bio

Dr. William Northway limits his practice to orthodontics with offices in Traverse City, Beulah and Grayling, Michigan. His dental training was at the University of Michigan and he achieved his orthodontic degree of M.S. at the University of Montreal. He is an active member and past president of the Edward H. Angle Society of Orthodontist and numerous other dental organizations. He has numerous publications and has lectured throughout the world.

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1. The incidence of congenitally missing lower second premolars is:
   a. One percent.
   b. Four percent.
   c. Eight percent.
   d. 15 percent.

2. According to Baccetti, CML5 is correlated with:
   a. Palatally displaced maxillary canines.
   b. Macrodontia.
   c. Microdontia.
   d. Midline displacement.

3. Hemisection in treating CML5 involves:
   a. Crowning the remaining mesial root of the second primary molar.
   b. Cutting the primary molar in half so that the two halves can be removed more easily.
   c. The removal of the mesial half of the second primary molar.
   d. The removal of the distal half of the second primary molar.

4. Hemisections work best when they are performed:
   a. Before age seven.
   b. Before age 10.
   c. Before age 14.
   d. Age is not a factor.

5. In the aftermath of a hemisected second primary molar, the alveolus of a nine year old will:
   a. Not atrophy because the permanent molar moves into the site.
   b. Atrophy and shrink to 80 percent of its original width.
   c. Atrophy and shrink to 50 percent of its original width.
   d. Eventually become infected and lead to the loss of the mesial half.

6. Hemisection is most effective:
   a. In the lower arch.
   b. In the upper arch.
   c. Either arch would be equally effective.
   d. When used on the left side.

7. Temporary Anchorage Devices (TADs):
   a. Consistently work well when bringing the molar forward in young children.
   b. Are not consistently reliable in young children.
   c. Should be used in the retro-molar pad region to push molars forward.
   d. Are best when placed in the maxilla for Class II anchorage.

8. The most effective biomechanical system of those listed below for protracting the molar in a CML5 case is:
   a. An Activator with Class I elastics.
   b. Power chain from molar to molar.
   c. Class II elastics.
   d. Intermittent Class I elastics on the lower.

9. If the second primary molar is extracted when the succedaneous premolar is missing, the most likely response is that:
   a. The permanent first molar will drift mesial, closing all of the space.
   b. The permanent first molar will erupt into its normal position.
   c. The permanent first molar will tip forward and become periodontally involved.
   d. The alveolar ridge in the extraction site will collapse, making ultimate space closure very difficult.

10. All of the following are likely consequences of advising that a child try to keep the primary molar when a second premolar is missing except:
    a. The root might spontaneously resorb at a later age requiring replacement.
    b. The tooth might become ankylosed and create periodontal problems.
    c. The size of the tooth may make proper interdigitation difficult.
    d. There is a 28 percent chance that the tooth will be healthy for a lifetime.

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