

## **The Ideal Sequence Of Canine And Premolar Eruption And Its Importance In The Development Of An Optimum Occlusion**

The discrepancy in size between the deciduous and permanent teeth in the canine and premolar area and the sequence of eruption of these teeth at the end of the mixed dentition period exerts a powerful influence on a developing malocclusion at this stage.

**Maxillary arch:** The ideal situation in the maxillary arch exists when the four maxillary incisors are perfectly aligned and the deciduous canines and all deciduous molars are in line the tissue prior to their eruption without crowding. The upper deciduous canine is typically smaller than the permanent canine which replaces it by about 1mm., while the upper first deciduous molar is about 0.1mm. larger than the first premolar, and the upper second deciduous molar is approximately 2.25mm. larger than the second premolar<sup>1</sup>.

For a **perfect maxillary occlusion to develop**, the following sequence should take place. The deciduous canine is the first to get loose and exfoliate and is followed quickly by the beginning eruption of the adult canine. If this tooth erupts without rotation or displacement, the arch ideally enlarges by 2.5mm (1.25 mm. per side)<sup>1</sup> which should accommodate these larger adult teeth (since the canine is larger than the deciduous canine by a mean of 1mm.). Ideally, the upper deciduous canine exfoliates first, and is then quickly followed by the exfoliation of the first deciduous molar. The adult upper canine is the first to erupt and is then followed by the first premolar in rather rapid sequence. At the same time, the upper second deciduous molar exfoliates and the last tooth in this sequence to erupt would then be the second premolar. This is the optimum order of exfoliation and eruption and will almost always ensure an ideal developing occlusion without crowding of the upper canines. Therefore, if the first deciduous molar becomes loose and exfoliates at the same time or very quickly after the loss of the deciduous canine and before the adult canine is one-third erupted, the canine can make room for itself by having its larger mesio-distal width occupy room distally at the expense of a part of the space previously occupied by the mesial area of the first deciduous molar. This is particularly important when the canine erupts with some slight rotation or displacement present. If the canine erupts without such rotation or displacement, it usually can make room for itself naturally by enlarging the arch. Therefore careful observation of this area is important since timing is critical to the success of the development of the occlusion especially if the canine is either slightly rotated or displaced.

In the same way, by the time the upper first premolar is one-third erupted (in the same example above), the second deciduous molar should be ready to exfoliate in order to allow the first premolar to occupy more room distally. This is necessary as the first premolar will be slightly larger than the space remaining after the adult canine erupts into the space distally following the stripping of the mesial of the

first deciduous molar. This sequence will almost always prevent crowding. If the size discrepancy of the canine and first premolar relative to their corresponding deciduous predecessors is small, this last sequence of exfoliation of the second deciduous molar might not be necessary. It should become obvious that if there is any slight variation to this ideal sequence of events, a less than ideal occlusion might result. It is, therefore, very important to carefully and frequently observe the patient during this important period of eruptive development. An observation schedule of every two months to observe the sequence of exfoliation by testing the mobility of the deciduous teeth is essential.

**A malocclusion can develop** when the adult upper canine is slow in emerging or takes a different path of eruption by displacing itself to the labial or lingual, or erupts rotated or angulated to the mesial particularly if it is the last of the sequence of posteriors to erupt and is left short of space by the mesial eruption of the first premolar. In an analysis of malocclusions, maxillary canine crowding usually caused in this manner, consists of about 30 % of total malocclusions, and probably represents about 20% of the total population. It must also be realized that slow erupting canines can also be due to their improper position initially, particularly when they have an excessive mesial inclination. The panoramic or intra-oral x-ray films should be checked particularly in those cases showing a delayed appearance.

If the ideal sequence of eruption is interrupted, as mentioned above, by a slow-erupting upper adult canine, a malocclusion frequently results. The late erupting canine that has been preceded by the full eruption of the two premolars where closure of the entire leeway space, has taken place in a mesial direction, is forced to the labial because of the small deciduous space remaining after the deciduous canine exfoliates. This can easily be predicted by observing the degree of elevation of the unerupted permanent canine in relation to the level of the first and second premolars on the panorex, intra-oral or cephalometric lateral x-ray films. Another alternative is to check if either of the upper first deciduous molars are getting slightly loose while the deciduous canines are not, and at the same time check with your finger for the height of the bulge caused by the unerupted permanent canine crown. If the adult canine is still quite high in tissue and the deciduous canine is firm, while the deciduous first molar is getting loose, a problem of labial crowding of the adult canine frequently results. This is caused by the initial eruption of the first premolar followed by the second premolar and the mesial drift of these teeth against the distal surface of the smaller deciduous canine. This closes up the discrepancy in tooth mass between the deciduous molars and premolars (leeway space) together with the mesial migration of the upper first permanent molars. When the adult canine finally does erupt, the force of its eruption is not strong enough to distalize the other teeth and since the remaining space is too small, the adult canine is often forced to erupt to the labial creating a complicated malocclusion frequently involving the extraction of premolars for its correction or distalization of all of the maxillary posterior teeth.

It should also be mentioned that it is possible for an erupting adult canine to be delayed or displaced by a non-resorbing deciduous canine root. It has to be determined whether the permanent canine would be aided or hindered by the extraction of the deciduous tooth. One must be careful in this

decision when there is a shortage of space. If the full deciduous canine root can be seen without resorption, overlaying the adult crown, it is an obvious sign of a non-resorbing deciduous root and often requires extraction. Prior to extraction, however, it must be determined that if the permanent canine is obviously displaced, it has sufficient room to properly realign itself and therefore has a good chance of erupting into place normally. If the angulation of the unerupted adult canine is very severe and has no chance of erupting properly, the deciduous canine should not be extracted until the adult canine has been successfully altered in its path orthodontically. There are times when the impacted canine cannot be brought into alignment properly and in such cases it might be advantageous to retain the deciduous canine following the extraction of the unsuccessful orthodontic procedure of the adult canine.

A simple procedure can be initiated **if it is suspected that the upper deciduous canine will be the last tooth to exfoliate** and the upper adult canine will be the last tooth to erupt in the upper arch. Simply disk 2mm. from the mesial of the upper first deciduous molar and add 2mm. of composite to the distal of the upper deciduous canine. When the first premolar erupts through tissue, 2mm. is disked from the mesial of the upper second deciduous molar. This forces the first premolar to erupt distally in the arch thus preserving the first permanent molar's distalized erupted position. Following the distalized eruption of the second premolar, the tardy canine can then simply replace the larger deciduous tooth and avoid the development of crowding in this area.

It must be remembered that when one bonds to the distal of the deciduous canine, the deciduous enamel surface should be slightly roughened with a stone and the surface is acid-etched twice as long as normal.

**Mandibular Arch:** The lower arch rarely presents a similar problem as the upper since the lower adult canine and first premolar almost always erupt at about the same time following the simultaneous exfoliation of their deciduous predecessors. It is very rare when a canine erupts after the leeway space is closed on the lower following the full eruption of both premolars. It does happen however, that if the lower adult canine erupts and the first deciduous molar remains in place, increased crowding of the lower incisors often takes place. It is important, therefore to remember that sequential stripping in the lower arch is very important in order to preserve the integrity of the incisal alignment (by preventing increased crowding of the lower incisors). If the lower canine erupts first, as mentioned above (prior to the first premolar), the mesial of the first deciduous molar should be stripped about 2mm. and then the mesial of the second deciduous molar is stripped 2mm. as the first premolar erupts. An alternative procedure would be to simply strip 2mm. from the mesial of the lower second deciduous molar as the adult canine erupts. If the second permanent molar erupts early as the deciduous canine exfoliates, it is recommended that a mandibular bumper or lingual holding arch be placed to maintain the molar's distalized position during the exfoliation and eruption of the teeth anterior to the adult molars.

The sequence of exfoliation of the lower deciduous canines and molars also has a great deal to do with increased mandibular incisal crowding or self-correction during the late mixed dentition. If the deciduous canine and first deciduous molar exfoliate at the same time, quickly followed by the loss of the

second deciduous molar, the crowded lower adult incisors can spontaneously improve or at least partially self-correct. If on the other hand, the adult canine forces its way into the arch while the first deciduous molar remains in place, the crowding of the lower incisors can increase. It is strongly recommended that frequent observations (every 2 to 3 months) be maintained during this period in order to properly monitor and possibly avoid these critical developing problems. Self-correction of crowding, however, does not occur frequently, since about 89% of crowded dentitions do not improve from 8 to 14 years of age<sup>2</sup>, and 37% of cases have an increase in mandibular crowding between 6 and 14 years of age<sup>3</sup>.

#### References:

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