The Development of Malocclusion Associated with Change to the Permanent Dentition

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Recently the author has reported that, in the lower dental arch, space caused by the extraction of deciduous molars closes primarily by the distal drifting of teeth mesial to the space.[1] Subsequent to this work, he has observed similar phenomena in the take up of the excess space that arises from the natural replacement of deciduous molars by their smaller permanent successors. It was noted that the excess space was not taken up by the mesial drifting of the first permanent molars in all cases as has been suggested.[2]

The sum of the mean mesiodistal widths of a lower first and a lower second deciduous molar in boys is 17.63 mm.[3] The combined mesiodistal widths of lower second premolars in boys is 14.36 mm. Therefore, the replacement of these deciduous teeth by permanent teeth will yield 3.27 mm, or approximately one-half the width of a lower first premolar (7.07 mm). This space must be utilized. Some of this will be absorbed by the replacement of the smaller deciduous canine (5.92 mm) by the larger permanent canine (6.96 mm) but this still leaves 2.2 mm, or approximately one-third the width of the lower permanent incisor (5.12 mm central, 5.95 mm lateral). Similar differences in tooth size are present in girls.[3]

Two types of buccal occlusion are found in the mixed dentition. Each of these types is described as normal.[4] The main difference between them lies in the relation between the first permanent molars. One type is recognized by the end-to-end occlusion of the first permanent molars. Ideally, these teeth assume the correct adult relationship by the mesial drift of the lower first permanent molars into the spaces resulting from the replacement of the large deciduous molars by their smaller permanent successors (Fig. 1).

The second type is distinguished by the fact that, even in the mixed dentition, the first permanent molars occlude in an adult Class I relationship. In many of these children there is a crowding of the lower incisors caused by excess of tooth material in the buccal segments.

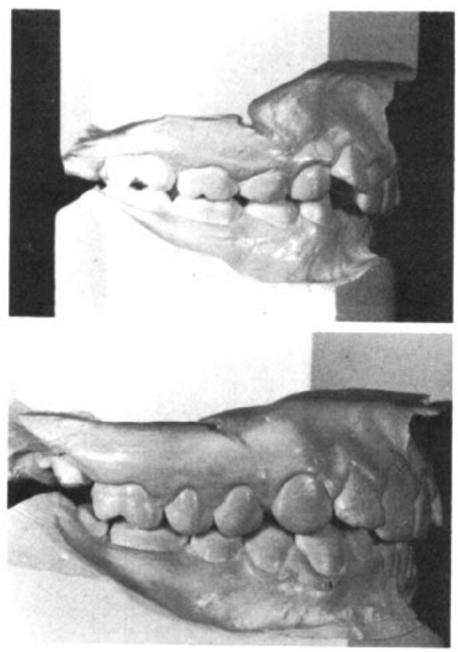

Fig. 1 Development of adult relationship. Above. End-to-end occlusion of first permanent molars for mixed dentition. Below. Adult relationship subsequent to mesial drifting of lower first permanent molar.

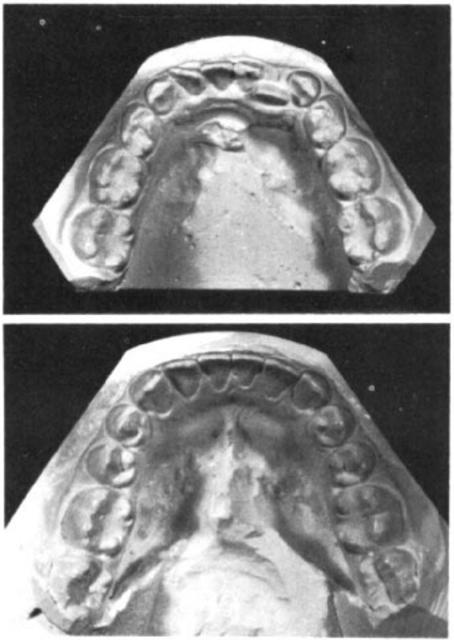

Fig. 2 A. Anterior crowding. B. Self-correction after the replacement of deciduous molars by smaller premolars.

The lack of space in the arches anterior to the first permanent molars is temporary and more apparent than real, as is the "malocclusion" (Fig. 2).

To summarize: in those children whose first permanent molars occlude in an adult Class I relationship, it is hoped the space gained, when the deciduous molars are replaced by their smaller permanent successors, will be taken up by an easing of the crowded anterior teeth. In children whose permanent molars are occluding end-to-end, it is hoped that the space will be taken up by the lower first permanent molars drifting mesially.

This ideal drifting does not occur in every child. A girl presented with a Class II malocclusion (Fig. 3a) at 8 years and 2 months of age that was treated with a Kloehn-type facebow. By the age of 10 years and 6 months the patient was in retention (Fig. 3b). The malocclusion was caused by the

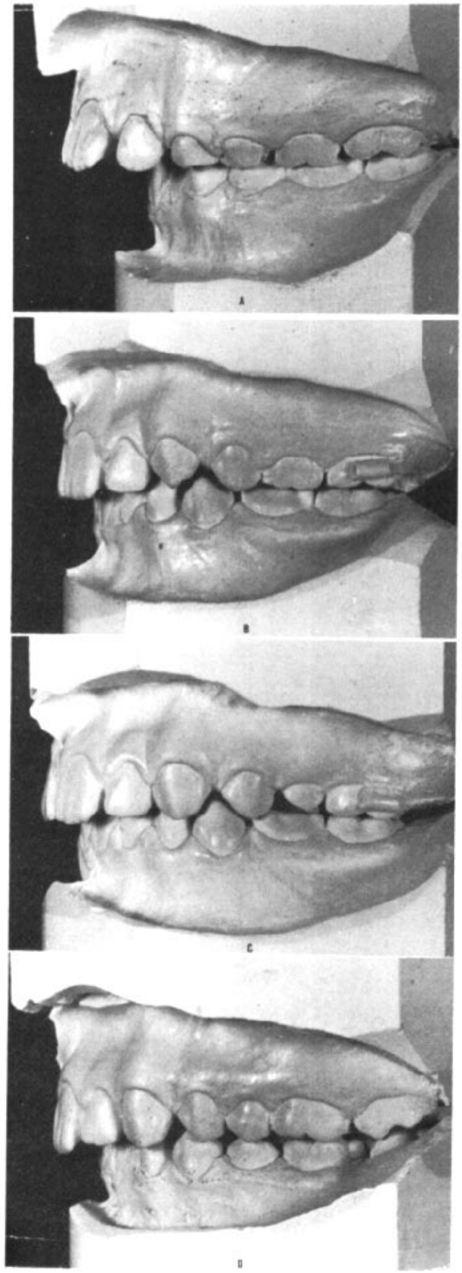

Fig. 3 Change to permanent dentition in a corrected Class II malocclusion. A. Before treatment; B. Retention; C. Subsequent to shedding of upper second deciduous molar; D. Permanent dentition.

mandible being posteriorly placed to the maxilla, which itself was mesially placed to the rest of the skull. Active treatment consisted of checking the forward growth of the maxilla with a cervical strap enabling the mandible to "catch-up".[5] This treatment was successful as can be seen in the cephalometric roentgenographic tracings (Fig. 4a) and the models (Fig. 3a, b). The models taken at the commencement of retention (Fig. 3b) show a well-locked Class I occlusion of the first bicuspids and a Class I occlusion of the first permanent molars although, because the cusps of the latter teeth were not particularly prominent, a firm cusp locking was denied. The cephalometric roentgenograms, superimposed on the anterior cranial base, reveal the changes typical of this type of treatment[5] (Fig. 4a). The occlusion was retained by allowing the patient to wear the appliance every second night for a period and then the post-retention observation period began. By the age of 13 years and 6 months an occlusion, as depicted in her models in Figure 3d, had developed. It appeared that the occlusion was relapsing and that the maxilla was outgrowing the mandible. However, roentgenograms did not support this possibility (Fig. 4b). Since retention the patient had grown normally and had maintained her facial proportions and profile. Consequently, the relapse to a Class II malocclusion was certainly not due to any skeletal changes. The key to the cause of the break-down in this normal occlusion is seen in an intermediate model taken at the age of 11 years and 6 months (Fig. 3c). This model shows that, subsequent to the replacement of the large upper second deciduous molar by the smaller second premolar, the upper first permanent molar had drifted mesially into the space so that it occludes with its lower antagonist in an end-to-end occlusion. The breakdown was completed by the distal drift of the lower first premolar into the excess space left by the replacement of the lower second deciduous molar by the second premolar. There had been an accompanying further mesial drift of the upper first molar, but virtually no mesial drift of the lower first molar.

It is considered that the headcap treatment did not interfere with the development of this child after its active use because similar unfortunate drifting

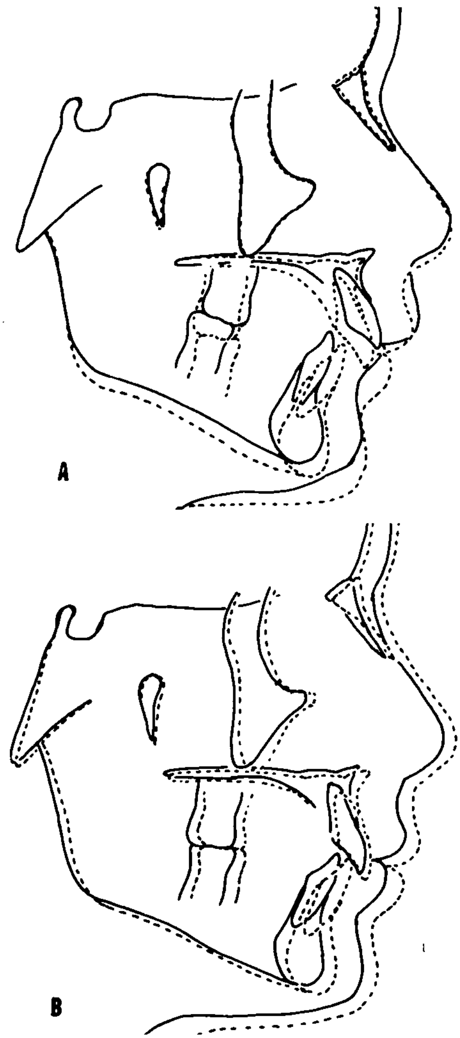

Fig. 4 Class II malocclusion. A. Before treatment———; Retention - - - -; B. Retention———; After retention - - - -.

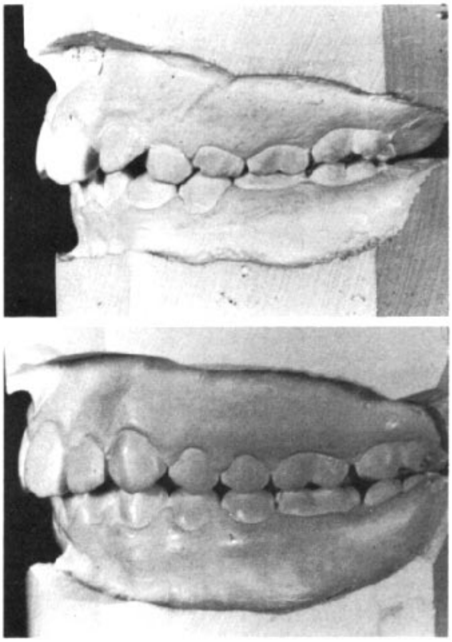

Fig. 5 Above. Normal occlusion at 8 years 6 months. Below. Class II occlusion developing subsequent to loss of second deciduous molar in same child at the age of 12 years 6 months.

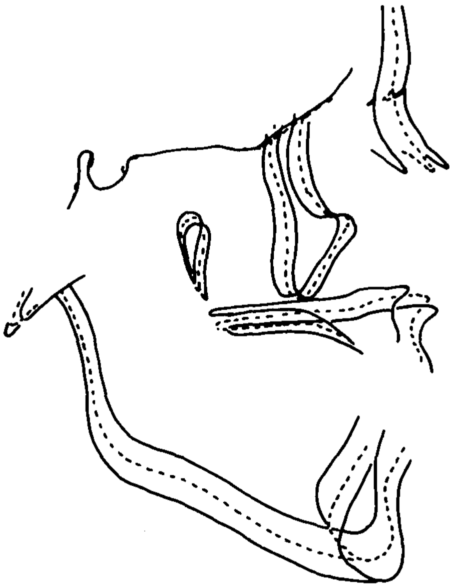

Fig. 6 Tracings of radiographs at 6, 10 and 12 years superimposed on anterior cranial base demonstrating normal skeletal development of child whose models are shown in Fig. 5.

occurred in a child enrolled in the Melbourne University Child Growth Study.[6] Between the ages of 2 years and 9 years, 6 months, she was examined by the author on fourteen occasions, and abnormal tendencies were not present. She did not have lip, speech, or tongue habits or other conditions that would necessitate a classification other than "normal". The models taken at 8 years and 6 months typified her occlusion up to this age. In Figure 5-above can be seen the Class I relationship between the lower left canine and first premolar and their upper deciduous antagonists, and the end-to-end relationship of the first permanent molars. An examination of the models taken at 12 years and 6 months (Fig. 5-below) reveals little change in the relationship of the first permanent molars. The lower molar has not drifted mesially into a correct adult Class I relationship with the upper molar. Instead, the lower first premolar has moved distally and appears to have an end-to-end relationship with the upper first premolar, but actually it is on the Class II side of such a relationship.

In this second child also, the development of a Class II occlusion between the first premolars was due to the unfortunate take-up of the space left by the replacement of the deciduous second molars by the smaller second premolars. Instead of the lower first molar migrating mesially into a Class I relationship with its antagonist, the lower first premolar has moved distally into a Class II relationship with the upper first premolar. That this has been brought about by tooth drifting and not by skeletal changes has been verified by the serial roentgenograms (Fig. 6). They show regular growth without spurts or retardations in individual bones.

Discussion

The change in the relation between the first premolars from Class I to Class II in these children could not have been caused by excess mesial drift of the upper denture. If this were so, the relation of the first permanent molars would have been affected. If mesial drift of the dentures had occurred, and one cannot confirm or deny this from plaster casts alone, then it occurred equally in both jaws. Otherwise the molar relationship would have been altered. The only interpretation that can account for the phenomena observed is that the lower first premolar has drifted distally with respect to the rest of the denture into the space made available on the replacement of the deciduous molars by their smaller permanent successors.

There are problems involved in the treatment or retreatment of these children. The author wonders what he would have considered to be the etiology of these malocclusions if they had presented before he made the present study. If he did not know the etiology, he could not purposely remove the etiological factors and could not make any accurate prognosis as to the stability of the treated malocclusion. An understanding of the etiology of these malocclusions makes it clear that the Class II relationship must be corrected by bringing the lower teeth mesially.

In the reduction of a Class II malocclusion with intermaxillary elastics, some orthodontists complain they cannot always set-up stationary anchorage in the lower jaw. Could it be that they always fail to set-up stationary anchorage and that their successes are only in those Class II cases brought about by distal drifting of the lower teeth, and which have to be corrected by moving the teeth mesially again?

The prevention of this unfortunate distal drifting offers problems. How does one ensure that a lower first molar is going to move mesially? Further study is necessary to enable the operator to determine in which children the molars will drift mesially, and those in whom the bicuspids will drift distally.

Summary

A Class II malocclusion can develop in a normal dentition by the lower premolar teeth drifting distally into the excess space resulting from the replacement of the lower deciduous molars by their smaller permanent successors.

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