Early developmental traits in Class II malocclusion

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Varrela J. Early developmental traits in Class II malocclusion. Acta Odontol Scand 1998;56:375–377. Oslo. ISSN 0001-6357.

The occlusal traits of Class II occlusion in the deciduous dentition include distal terminal plane of the second deciduous molars, distal canine relation, large overjet, and large overbite. Other findings are narrow upper dental arch and maxillary base and poor anterior spacing. Skeletally, Class II children differ less from normal children. The cranial base, including the base flexure, and the maxilla are normal. The mandibular corpus and lower facial height are short, the gonial angle is large, and the dentoalveolar position of the mandible is retruded. The height of the ramus is normal, as is the skeletal position of the mandible, with the exception of the chin, which becomes slightly retruded after 5 years of age. As most skeletal traits of Class II occlusion develop later than the occlusal characteristics, it is suggested that no evidence can be found for a skeletal Class II growth pattern in the deciduous dentition. The deficient transversal growth of the maxilla and the sagittal growth of the mandible seem to cause the typical Class II occlusion. Further skeletal changes are likely to develop as secondary adaptations. □ *Class II malocclusion; deciduous dentition; distal occlusion; occlusal development; skeletal development*

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A Class II occlusal relation is a common type of malocclusion. Epidemiologic studies reveal that 20%–30% of children show signs of Class II occlusion during dental development (1–4). It is worth noticing, however, that postnormal occlusion was a rare condition only a couple of centuries ago (5, 6). Records from Finland indicate that a significant increase in the frequency of Class II occlusion has taken place as recently as during the 20th century. A study by Ant-Wuorinen (7) shows that about 13% of children had distal occlusion in the 1920s. The frequency had almost doubled by the 1960s (1).

In many children a postnormal occlusal relation is established early. Heikinheimo & Salmi (8) found that 12% of children had a Class II occlusion at the age of 5 years, and a further 2% showed a Class II tendency. Longitudinal studies indicate that when a Class II occlusion is found in the deciduous dentition, usually no spontaneous correction can be expected (9–11). Once established, a Class II occlusion seems to be transferred from the deciduous to the permanent dentition. Therefore, knowledge of the early phases of craniofacial growth and occlusal development is of importance in understanding the dynamics of development that lead to a postnormal occlusal relation. However, little attention has been paid to the development of Class II occlusion in the deciduous dentition.

This review analyzes some preliminary results of mostly unpublished, ongoing research on the development of a postnormal occlusal relation in the deciduous dentition (12–14). The findings are based on a comparison of two groups of children, one developing Class II occlusion and the other with normal occlusion. The samples were drawn from the longitudinal database of the Burlington Growth Centre, Toronto, Canada, using clinical records at late mixed and early permanent dentition. The review summarizes important features of occlusal and skeletal development of Class II children studied from the dental casts and lateral cephalograms taken annually from the ages of 3 to 7 years.

Development of occlusion

Children developing a Class II occlusion show a postnormal relation of the deciduous molars and canines already at the age of 3 years, and the relation becomes more distal by the time the first permanent molars start to erupt. Overbite and overjet are larger than in normal children throughout the period of the deciduous dentition. Compared with normal children, those with a distal occlusion have narrower intercanine and intermolar distances in the maxilla. The difference is present at the age of 3 years, and since the increase in arch width during the period from 3 to 7 years is less in Class II children, it becomes greater with age. On the other hand, the lower dental arch is of normal width, making the ratio of upper to lower arch width smaller in Class II children. Arch length, in both the maxilla and the mandible, differs only slightly from normal length. Spacing in the anterior segment does not increase during the period from 3 to 7 years, as it does in normal children. Instead, the anterior spacing shows a slightly decreasing tendency with excess space of about 3 mm just before the first permanent incisors start to erupt, compared with almost 6 mm in normal children. According to the longitudinal study by Leighton (15), the risk of anterior crowding is 40%–50% in children with spacing of 3 mm, whereas with extra space of more than 6 mm, the chance of crowding becomes negligible. It seems likely that the lack of space in Class II children reflects the slow transversal growth of the maxillary arch.

It is evident that practically all of the occlusal characteristics traditionally connected with a Class II relation are present already at the age of 3 years or develop shortly thereafter. The narrowness of the upper dental arch and its slow growth suggest that the transversal development of the maxilla is hampered. The cause of this, whatever it might be, must also start to operate well before the age of 3 years. Terminal plane, canine relation, and overjet all reflect the distal position of the mandibular dental arch as compared with the maxillary dental arch. This relation also seems to be established early, during the period when the deciduous teeth are erupting and the deciduous occlusion is developing.

Skeletal development

In the configuration of the cranial base, as measured by the angles between the sphenoid, clivus, and foramen planes, Class II children do not differ from normal, at least not before the age of 7 years. This finding contradicts the suggestion that the configuration of the cranial base is an etiologic factor in the development of Class II occlusion (16, 17). It does not, of course, rule out the possibility that an association between the cranial base flexure and the position of the mandible could develop later. Further skeletal similarities between Class II and normal children are found in the maxillary dimensions: all indicators of the size or the skeletal and dentoalveolar position of the maxilla show normal values. This is in agreement with the finding by McNamara (18) that the maxilla is normal in the majority of older Class II children.

In the mandible of Class II children, the height of the ramus is normal, whereas the mandibular base and lower facial height are both short. The skeletal position of the mandible is practically normal until the age of 5 years, but the chin becomes gradually more retruded thereafter. The dentoalveolar position of the mandible, on the other hand, is retruded already at the age of 3 years and becomes more so with age. The gonial angle is larger than normal during the whole period. However, it does not show any tendency to increase and therefore cannot be interpreted to indicate a tendency of the mandible to rotate posteriorly.

The early skeletal signs of Class II development are thus mainly restricted to the mandible. In sagittal section no differences can be found in the cranial base or maxilla. Only transversally does the maxilla seem to be narrow, assuming that the arch width can be used as an indicator of the width of the maxillary base. According to McNamara (18) excessive facial height can be found in 30%–50% of Class II patients over the age of 8 years. It is therefore of interest that the facial height of Class II children is shorter than normal from 3 to 7 years. This suggests that the increase in facial height appears fairly late in the Class II development. Similarly, if indeed there is an association between a flat skull base and distal occlusion, this also develops late and is likely to present an adaptation of the cranial base flexure to the relation between the jaws, rather than vice versa.

Dynamics of early class II development

If we analyze the occlusal and skeletal findings in the deciduous dentition, a new picture of Class II development emerges. In children who develop a Class II occlusion in the permanent dentition, the occlusal traits of postnormal occlusion are present early in the deciduous dentition, whereas only few skeletal signs can be detected. We do not find evidence to support the commonly held idea of a Class II growth pattern that will eventually lead to the development of occlusal deviation known as postnormal occlusion. Rather, it can be suggested that many skeletal signs of Class II occlusion, as we know them in older children, represent secondary adaptations.

This does not mean that skeletal changes are unimportant in Class II development. The narrow maxillary width and distal dentoalveolar position of the mandible are both present early and are obviously important components of Class II development. Actually, most Class II occlusal traits can be explained as resulting from deficiencies in the transversal growth of the maxilla and sagittal growth of the mandible. Whether the distal position of the mandibular arch is a reaction to a narrow maxillary arch, as suggested by Schwarz (19), or whether both develop because of some other causative factor has not yet been determined. The fact that Class II malocclusion has became increasingly common over a short period of time suggests that the factors that interfere with orofacial development are mainly environmental (20). These are likely to include functional influences from mastication, oral breathing, posture, and oral habits (21).

The findings on the occlusal and skeletal development of Class II malocclusion in the deciduous dentition have clinical significance. If no Class II skeletal growth pattern exists, earlier treatment can be considered without the risk that the skeletal growth will override the results of the treatment. Once the occlusal relation is established in early deciduous dentition, it will function as a lock that will further affect the skeletal development. By opening the lock (i.e. by normalizing the occlusal relation), it may be possible to prevent the development of secondary adaptations, which later are either difficult or impossible to treat orthodontically and function as elements causing relapse.

Acknowledgements.—This study was made possible by the use of material from the Burlington Growth Centre, Faculty of Dentistry, University of Toronto, which was supported by funds provided by 1) National Health Grant No. 605-7-299 (Canada) (for data collection); 2) Province of Ontario Grant PR 33 (for duplicating); and 3) the Varsity Fund (for housing and collection). This study was supported by the Academy of Finland and the Finnish Dental Society.

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