

THE RELATIONSHIP OF CORRECT OCCLUSION AND ATTRITION IN PREHISTORIC AND CIVILIZED MAN, ON THE BASIS OF BEGG'S OCCLUSAL THEORY

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Abstract

Occlusal and approximal attrition is correlated to the mesial and vertical migration of the teeth. Mandibular growth is also a very important factor in the development of dental arches. The purpose of this article is to examine the difference between the dentition of civilized and prehistoric man and to establish whether mandibular reduction can cause occlusal dysharmony in the evolutionary process. The research was based on BEGG's theory.

Key words: attrition, migration, dental arch reduction, mandibular reduction.

Introduction

It has been observed by anthropologists and orthodontists that the occurrence of crowded teeth is less frequent in primitive human groups than in civilized population. In the latter case, malocclusion is quite recurrent. It has also been stated that the evolutionary reduction of jaw size is greater than the reduction of teeth size. The Australian BEGG, one of the disciples of ANGLE, dealt with the theory of occlusion.

In BEGG's occlusal theory, the phylogenetic development of the dentition and jaw bones was taken into consideration. Correct occlusion is not a static condition and a fixed anatomic state, but a changing functional process undergoing continual modification and adjustment during the whole life of both deciduous and permanent dentitions.

The relationship of the individual teeth in the same arch, the relationship of the teeth of one arch to those of the opposite arch, and the positional relationships of the teeth to the jaw bones change continually throughout life. Two important factors in correct occlusion are the positions of the teeth in the jaw bones and the anatomy of the individual teeth. These factors contribute to the reduction of the alveolar process and the development of adequate dental arch length.

Discussion

The migration of teeth is a basic physiological factor. It determines the positions of the teeth in the jaw bones. Throughout life, the teeth continually migrate in two directions (GOTTLIEB, 1927): horizontally (mesial migration) and vertically (continual eruption). Continual mesial migration and continual vertical eruption compensate for tooth attrition (MURPHY, 1959a).

Many writers (STRANG, 1943; HUCKABA, 1952) refer to the forward migration of the teeth as if it were an abnormal and undesirable phenomenon that causes the teeth to move bodily forward and to tip or lean obliquely forward, thus producing malocclusion such as crowding of the teeth, especially the anterior teeth, and also the condition known as bimaxillary protrusion. These writers consider that this forward migration of the teeth is due to abnormal and perverted muscular forces from the lips, cheeks, tongue and throat, and also to perversion of the axial stress of the teeth during mastication. "Anterior component of forces" is the name used in the orthodontic literature to designate the force, from whatever source it is considered to emanate, that causes this undesirable mesial migration of the teeth. Although mesial tooth migration does produce malocclusions, it is a normal physiologic phenomenon.

Another important factor in the development and maintenance of correct occlusal relationships is the changing anatomy of the teeth. The anatomic forms of the teeth begin to change soon after eruption. This change is due to tooth wear, which takes place both occlusally and interproximally. According to BROCA's (1879) research, continual loss of tooth substance by attrition is a normal functional process and absence of this loss produces abnormalities. Thus, it can be stated that physiological mesial and vertical migration compensate for the physiological approximal and occlusal attrition. The reduction of the dental arches is not sufficient to fit into the evolutionarily reduced jaw bones. The evolutionary reduction of jaw size may be sufficient to account for many of the grosser conditions of malocclusion and dentofacial anomalies.

The accepted normal textbook occlusion of civilized man is phylogenetically incorrect because his food is too soft and concentrated to cause tooth attrition. The incisal, occlusal, interproximal and axial relations of his teeth remain almost static throughout life because of the firm locking of the unworn cusps. Anatomically correct occlusion can develop only when there is sufficient attrition of the teeth for them to assume correct occlusal relationships (BEGG, 1954).

It may be said that phylogenetic mandibular reduction is compensated by attrition, reducing the size of the dental arch to the size of the jaw bone. This condition is found in Stone Age man. Stone Age man's teeth display occlusal and interproximal attrition, often so marked that the dentine is exposed and much worn occlusally, incisally and interproximally.

Occlusal attrition was arranged into four groups by BROCA (1879). Nine states were recognized by MURPHY (1959b) on the bases of the amount of dentine exposed on the occlusal surface. Approximal attritions were also described and grouped by CAMPBELL (1925), SHAW (1931) and MILES (1962). The existing contact points first

become flatter contact surfaces, and during this period the convex aspect of one tooth comes into close contact with the concave aspect of the approximating tooth, and the concave area of the former with the convex area of the latter.

Dental arch reduction was examined in 19 Australian aboriginal skulls by BEGG (1954). He found that before the eruption of the third molar, the reduction was 5.28 mm in one quadrant. His method was as follows. Each tooth was built out or restored to what was judged to be its full original unworn mesiodistal width, and was compared with the size of the discovered abraded teeth. He found that the average reduction in length of the whole dental arch from the distal surface of one seventh molar to the other is 10.56 mm; in addition to the mesial and occlusal abrasion in dental arch reduction, the width of the dental arches (MURPHY, 1964) and the height of the palate (LYSELL, 1958a) were taken into consideration. According to Murphy, the reduction was 3.5 mm, LYSELL (1958b) reported 4.5 mm and GOOSE (1962) found that the reduction was only 3.2 mm. The authors stated that the differences in size of the reduction were due not only to different methods but to diet, hybridization, age and sexual dimorphism. A brief outline of the development of dental arches (deciduous and permanent) in primitive and civilized man follows.

Immediately after eruption of the deciduous incisors, there is an overbite of these teeth. As all the deciduous teeth erupt in Stone Age man, attrition causes a reduction of the size of each tooth occlusally, incisally and interproximally. There is maintenance of occlusal contact. There is also maintenance of interproximal contact because all the teeth move mesially around the curve of the arch and remain in proximal contact. Hence, the occlusal relations of the teeth are such that the distal surface of the lower second deciduous molar is further mesial than the distal surface of the upper second deciduous molar.

Due to extensive interproximal wear and maintenance of the proximal contact of the deciduous teeth, the overall mesiodistal lengths of the upper and lower deciduous dental arches are reduced. Therefore, the first molars erupt into positions further mesially in the jaws than in civilized man. In civilized man, the first molars are never far enough mesially after eruption, nor are they in their anatomically correct positions in the jaws, except perhaps in those rare cases where all the teeth are so relatively small that they remain spaced, and perhaps also in some cases of caries of the deciduous teeth.

When the permanent incisors first erupt, there is an overbite, just as there is throughout life in civilized man. However, mastication of hard, coarse, fibrous, gritty food soon causes Stone Age man's permanent incisors to wear incisally, at first at an oblique angle. The obliquity of the plane of wear of the incisal edges at first points downward and forward; this obliquity is gradually reduced as the lower incisors move labially, relative to the upper incisors.

Ultimately, this plane of wear becomes horizontal and in the same straight line as the flat plane of occlusion of the dentition generally (CAMPBELL, 1925). In civilized man, there is a lack of attrition of the incisors and the overbite becomes permanent.

HUNT (1961) demonstrates that in civilized children, during the second dentition, resorption of the anterior aspect of mandibular ramus takes place and it coincides with

the calcification of the crown of the posterior molar teeth. Perhaps this dental stage is traversed in a more mesial position in the primitive mandible and with less resorption.

Accordingly, the primitive mandible at maturity has a border ramus than is seen in most civilized persons. According to BJÖRK (1955), the change in mandibular ramus allows the eruption of the third molars in the narrower, more gracile jaw bones of civilized man, but the eruption is often retarded. Retarded eruption is increased by the lack of vertical and approximal attrition, and the absence of mesial migration and continual eruption in civilized man.

Conclusions

Normal occlusion develops only in those civilized individuals who have too small an amount of tooth substance, if assessed by Stone Age man's requirements, which, after all, are evolutionarily the correct quantitative relationships of tooth to bone. This accounts for there being so relatively few civilized people with the full complement of teeth in normal textbook occlusion.

On the basis of these findings, BEGG's theory can be criticized as follows:

1. A small number of skulls were examined and the results were not interpreted correctly, (MURPHY, 1964), so dental arch reduction was not precisely defined.
2. He did not take into consideration the normal course of the second dentition, e.g. the circumstances of deciduous spacing.
3. He could not have known the accepted theory of mandibular growth, BJÖRK rotation, (BJÖRK and SKIELLER, 1972; 1983), which explains the conditions of the development of the regular and irregular dental arches.

On the other hand, as the dentition of civilized man is rarely abraded, BEGG's suggestion to reduce the length of the dental arch by extraction seems to be acceptable. It can be stated that extraction is the causal therapy of crowding.

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