A Dental Investigation Of Bantu Children

By M. Savage, L.D.S.

Oxford, England

This study was conducted in the primitive tribal area surrounding Ngara in the West Lake Province of Tanganyika. The subjects were Hangaza, one of the Barundi Bantu groups. The dental tissues and skeletal structure of 459 children between the ages of 3 and 18 years were investigated. The older children who were studied were in Government schools; others were examined in bush villages and medical aid dressing stations. School records were used to estimate age; for the younger children where these were not yet available the ages were assessed by reference to the number of younger sibs, *not* dentition.

Results

The results for the whole sample are set out in Table 1. Briefly, skeletal classification in orthodontics expresses whether the dental support bone of the mandible lies directly beneath (normal), posteriorly to (Class II), or anteriorly to (Class III) that of the maxilla (Tulley and Campbell, 1960); in assessing children as skeletally normal, allowance was made for the differences in bone structure from European children discussed below. Carious lesions were reported as such if they were discernible by mirror and probe. Regarding skeletal structure, nearly all the Bantu adolescents examined showed the typical profile, bimaxillary prognathism with a large Frankfort mandibular plane angle, an obtuse mandible angle, spacing of the teeth and bimaxillary dental protrusion. Table 2 shows how these characters increase in incidence with age. The increase is particularly marked in the 7-12 year group. The total number of subjects in the oldest group (>16 years) is small so that its lower percentages could be due to chance.

TABLE 1

Skeletal classification	*Number*	%
Normal	403	87.8
Class II	19	4.1
Class III	37	8.1
Increased Frankfort Mandibular plane angle	404	88.0
Orthodontic malformations requiring treatment	22	4.8
Carious lesions	83	18.1

TABLE 2

Age Group	Bimaxillary Prognathism		Obtuse Angled Mandible		Spacing		Dental Protrusion		Total Seen
	No.	%	No.	%	No.	%	No.	%	
3- 6 yrs.	9	5.2	99	56.9	15	8.6	15	8.6	174
7-12 yrs.	114	79.2	126	87.5	123	85.4	117	81.3	144
13-16 yrs.	108	92,3	114	97.4	102	87.2	99	84.6	117
17 plus yrs.	18	75.0	21	87.5	18	75.0	15	62.5	24

In 141 adolescent children 13-17+, 114 showed dental protrusion as well as bimaxillary prognathism.

Discussion

Bimaxillary prognathism.

Bimaxillary prognathism is a characteristic of several races, and there have been several studies of this feature, summarized by Björk (1955). He found that, while the prognathic tendencies of the maxilla increase little after the age of 12 years, mandible growth continues until the mid-twenties. In the present survey it was found that children with the full deciduous dentition, or in the early mixed dentition period, did not show a marked bimaxillary prognathism and it seems that in this age group the anteroposterior growth of the maxilla and mandible has not yet started to affect the shape of the profile. Moreover, in this age group the dentition did not exhibit the marked inclinations and spacings of the teeth which did not appear until the stage of the late mixed dentition and permanent dentition, when the true Bantu profile, with bimaxillary prognathism and secondary spacing and proclination of the teeth, was very much in evidence.

There has been some discussion in recent years as to the extent to which the increase in anteroposterior dimensions and width of the dental arches of some primitive peoples are genetic or not in origin. Increased use of the muscles of mastication, with consequent increase in bone growth, is one cause which has been suggested. As a converse expression of such a phenotypic effect Price describes a syndrome "degeneration of the face" due to faulty foods, which may occur within a single generation regardless of the race or primitiveness of the population. In the area of the present investigation the staple diet is a porridge made from either maize or green plantains, meat being a luxury, eaten perhaps on average once a month. This meat, when obtained, is usually eaten in a half-cooked state, and is naturally tougher and more fibrous than that eaten as part of the regular European diet. On most days, however, it seems to me that these people probably use their masticatory muscles less than the average European, so that it seems unlikely that there is any appreciable functional effect contributing to the increase in size of the dental arches and hence giving the typical facial profile seen to have developed by early adolescence. The alternative explanation is that it is mainly genetic in origin. The bimaxillary protrusion of the jaws probably stems from a more active anteroposterior growth in the areas of the sphenoccipital synchondrosis and sphenoethmoidal synchondrosis. The latter becomes fixed at the age of two and a half years, so that any growth in the area after this age is reached results in a shift forward of the anterior cranial face. Genetically controlled variations in these growth patterns could well explain the racial differences in dentofacial characters reported here and in other studies (e.g. Hong, 1960).

Eruption time.

It was unfortunate that the absence of accurate age data precluded study of the patterns of eruption in relation to age. However, using crude methods of age assessment, the impression was received that in the majority of children eruption appears to be considerably ahead of the normal eruptive dates for permanent teeth in European children. Many of the adolescent children had third molars erupted and in occlusion at ages not greater than 15-16 years, a finding similar to that of Mackay and Martin (1952) on East African Bantu children of known age. In a high proportion of these adolescents it was also noticed that there was spacing between all the thirty-two teeth present. In the Australian aboriginal dentition, Begg (1954) estimated that there was considerable reduction in the

perimeter of the mandibular dental arch before the third molars erupted, due to the reduction of crown diameters through attrition; as a result the third molars were situated approximately where the second molars occurred in civilized adolescents with completely unworn and caries-free dentitions. In the present survey, however, a relatively small amount of cuspal attrition was observed in the permanent dentition of the majority of the children studied, while in the deciduous dentition little or no attrition was seen, confirming incidentally the impression that the teeth are not heavily used. The amount of attrition observed, then, could in no way compensate for the early eruption, occlusion and in many cases spacing of the third molars observed. These can only be explained by the increase in anteroposterior length of the mandible and maxilla. It has been pointed out by Fanning that even in civilized adolescents the third molars tend to appear early if space for them is available. In the Ngara survey only one case was observed of a mesioangular impaction of the lower third molar due to lack of spacing.

Again, in the Australian aboriginal, Barrett (1957) observed that some permanent second molars appeared before all the deciduous molars had been exfoliated. By comparison, in a sample of American children in Ohio (Garn *et al,* 1957), only a minority showed this sequence. In the present Bantu series there was only an exceedingly small minority with deciduous molars still present when the second molars were erupted.

Size of palate.

In the Ngara Bantu the palate was low and flat and considerably larger in area than the average palates of European children of comparable ages. Hunt reported and discussed this feature in Australian aborigines, suggesting that growth at the median palatine suture was responsible for the increase in width, this suture being less active in civilized children and so producing the narrow and often crowded maxillary arches. He suggested that the degree of sutural response in this area appeared to be graded according to the amount of masticatory stress within the facial skeleton during childhood; however, from the diet and habits of the Ngara children, discussed above, in which there appears to have been no increase of the masticatory stress, there may be other explanations.

Orthodontic malocclusions.

Of the extremely small percentage of malocclusions observed in the Ngara children, most were crossbites, due probably to injuries received at birth as they were usually coupled with other facial deformities.This figure is remarkably low by comparison with the fifty per cent incidence quoted by Salzmann in children in America who have malocclusions requiring treatment. One wonders if the low incidence of malocclusions in the Bantu children as compared with the normal civilized child (accepting the bimaxillary prognathism as normal in the Bantu) represents the operation of selection. The diet is so poor, parental care so limited, that children with severe malocclusion would be unable to derive the maximum from their diet, and would therefore tend to be more prone to the deficiency diseases, and particularly in periods of scarcity. Such an effect would of course not be obvious in highly civilized communities since any orthodontic disadvantages are nullified by treatment, and the high standards of parental care and the artificial diet overcome impairments of masticatory function.

Influence of the tongue and lips.

In the majority of subjects observed it was my impression that the tongue

was larger than in a European child of comparable age and size. Aitchison (1950) states that active growth of the tongue plays some part in the expansion of the dental arches, so that increased tongue size may be in part responsible for the growth of jaws in the Bantu children. It was remarked by Moyers (1959) that in a true bimaxillary prognathism axial inclinations of the teeth are nearer normal than in a bimaxillary dental protrusion; in a large proportion of the early adolescent Bantu children seen in the present study, besides the true bimaxillary prognathism there was apparent, particularly in the maxilla, a true dental protrusion of the incisors. It is possible that part of this incisal protrusion may be due to thrusting of the large and powerful tongue when sealing the anterior portion of the mouth during swallowing. There is, however, a further factor; in the Bantu jaw the Frankfort mandibular plane angle is greater than the 27° usual in normal Europeans. The fact that the Bantu mandible continues to grow in a downward and forward direction for some time after the anteroposterior growth in the maxilla has ceased would therefore cause the mandibular incisors to exert pressure on the palatal surface of the maxillary incisors, which would tend to increase their angle to the Frankfort plane.

Further influence is probably exerted by the lips. In European children thin muscular lips are well recognized as one of the causal agents of anterior malocclusion, while lip-incompetence, associated with loose, thick lips, tends to reduce the stability of the dentition, allowing incisor drift and tilting. The typical Bantu profile exhibits thick, bulbous lips. In the children examined no incisors were seen which appeared to have drifted and tilted more than the usual axial angle regarded as normal in their case. The thick lips therefore are probably not incompetent and must exert some form of balancing force. Indeed, one wonders whether the lips habitually classified as normal and competent during an orthodontic diagnosis on European children do not have a positive restraining function on the anterior teeth instead of merely keeping them in balance, and hence may assist in causing imbrication in these teeth.

Disease.

The percentage of active caries observed is exceedingly small by comparison with that found in a comparable group of European children. On questioning it was noticed that a marked proportion (some two thirds) of the eighteen per cent with caries were the children of government employees, store keepers and political and tribal leaders — i.e., the minority who had sufficient income to provide an intake of refined sugars and carbohydrates of various types of high sugar content, usually in the form of very sticky boiled sweets cheaply made in East Africa. Whereas in European children it is the first molars that are predominantly attacked by caries, in the present Bantu series it was the second molars that appeared to be particularly susceptible. This observation is supported by similar findings in the Dental Department at Kampala Hospital. This could be explained if a prolonged breast-feeding period covered the critical formative stages of the first molars, weaning to the poor staple diet of the normal populace occurring during the formative stages of the second molars. Enquiry into the duration of nursing in this population would therefore be of interest.

A reasonable standard of oral hygiene was observed in the older school children, and this was probably attributable to organized cleaning sessions using a tooth stick. However, some paradontal trouble was discovered usually in those

with a low standard of oral hygiene. Also noted was a large amount of supragingival calculus, and a further feature was a peculiar dark-brown stain seen mainly in the palatal and buccal areas of the upper molars and, not so frequently, on the lingual surface of the lower molars. It was rather like the nicotine stains found in a very heavy smoker; it could be scraped off with a metal instrument and was seen throughout the age groups examined. Presumably it is due to some vegetable stain from the diet.

Nilo-hamites.

It is worth noting that a further three children of Nilo-hamitic stock were examined in addition to the Bantu children reported on above. In these three subjects the profile and Frankfort mandibular plane angle of each child were similar to those observed in Europeans. Two of these children showed overcrowding and imbrication in the premolar and canine regions and would be subjects for orthodontic treatment.

Summary

The incidence of some dentofacial traits and their variation with age in Bantu children is described. The bimaxillary prognathism observed is a genetic feature, functional activity having little or no effect on it.

Dental protrusion of the upper and lower anterior teeth, and their spacing, are the result of the true bimaxillary protrusion, assisted by the powerful tongue, the growth of the obtuse angle mandible, and the texture of the lips which appears to be sufficient to hold the teeth in balance without retarding forward spacing and growth.

Orthodontic malformations which would normally be seen in a comparable group of European children are rare.

There is a general lack of caries, except in those children whose diets have been contaminated by civilized foods. In affected children the distribution of caries is peculiar, second molars instead of first molars being attacked.

"Eburacum," Freeland

Acknowledgments

Acknowledgment is made to R. E. S. Tanner, Esq., for specialized information on the customs of the children examined, to the staff of the Dental Department, Kampala Hospital, Uganda, and to Dr. D. F. Roberts, University of Oxford for his suggestions and help.

Literature Cited

Aitchison, J., 1950 *Dental Anatomy,* 2nd Edition, Staples, London.

Barrett, M. J. 1957 Dental observations on Australian aborigines; tooth eruption sequence. *Aust. Dent. J., 2,* 217-227.

Begg, P. R. 1954 Stone age man's dentition. *Am. J. Ortho. 40,* 298-312, 373-383, 462-475, 517-531.

Björk, A. 1955 Facial growth in man, studied with the aid of metallic implants. *Acta Odont. Scand., 13,* 9-34.

Fanning, E., quoted in Hunt, 1961.

Garn, S. M., Koski, K. and Lewis, A. B. 1957 Problems in determining the tooth eruption sequence in fossil and recent man. *Am. J. Phys. Anth., 15,* 313-331.

Hong, Y. C. 1960 The roentgenographic cephalometric analysis of the basic dentofacial pattern of Chinese. *J. Formosa Med. Ass., 59,* 918-935.

Hunt, E. 1961 Malocclusion and civilization. *Am. J. Ortho., 47,* 406-422.

Mackay, D. H. and Martin, W. J. 1952 Dentition and physique of Bantu children. *J. Trop. Med. Hyg., 55,* 265-275.

Moyers, R. E. 1959 *Handbook of orthodontics.* Year Book Publications, Chicago.

Price, W. A. 1939 *Nutrition and physical degeneration.* Hoeber, New York.

Salzmann, J. A. 1957 *Principles and prevention in orthodontics.* Lippincott, Philadelphia.

Tulley, W. J. and Campbell, A. C. 1960 *A manual of practical orthodontics.* Wright, Bristol.