The Relative Influence of the Activity Of Artificial and Breast Feeding On Facial Development

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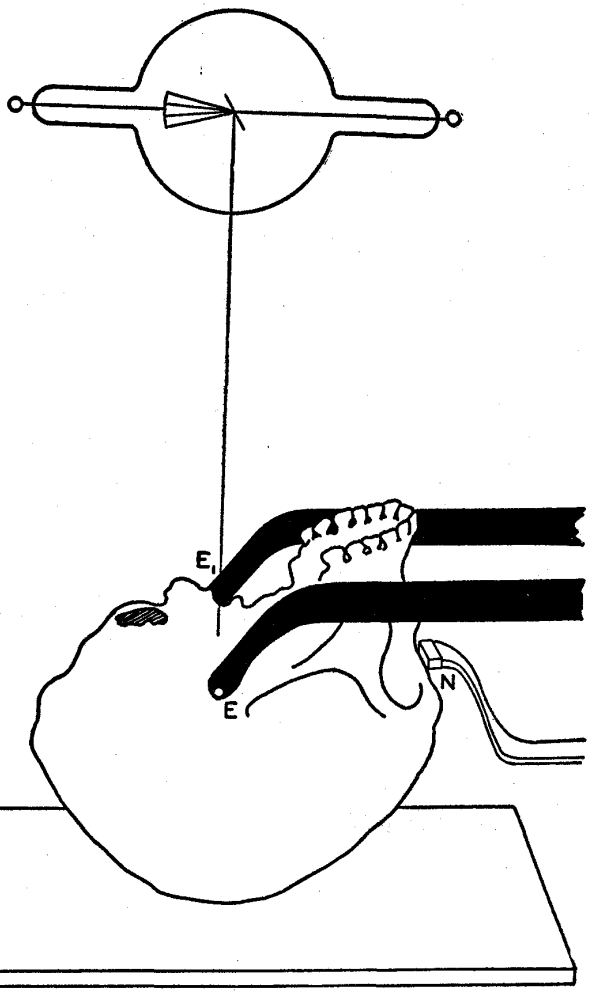

PLATE B

THERE HAS been much discussion of the emotional harm done to infants as a result of the trend of artificial feeding which has resulted from social pressures (1) (2) (3) (4) (5). This study seeks to determine whether mothers who artificially feed their children are doing these babies physical harm as well.

Dento-facial deformity which requires mechanical reconstruction (by means of such aids as braces, retainer, and bands) seems to be an ever increasing problem. There can be no doubt that in some measure, modern dento-facial problems are encouraged, if not actually caused, by defective and arrested growth referable to improper diets, pathologic conditions in the nose and throat, or generally poor health that affects the entire organism. The wholesale artificial feeding of infants is another factor which possibly contributes to the development of these dento-facial problems.

Some of the strongest muscles of the body are those which are used for the purpose of mastication of food and the bones of the child are soft and pliable. As these muscles are exercised in chewing, they pull on the bony structure of the skull and increase its size. The action of suckling at the breast and sucking on a rubber nipple of a bottle have been analyzed, and their respective effects on the muscles of mastication and the jaws are noted in both medical and dental literature (6) (7) (8) (9).

THE CAUSE

It has been claimed that the exercise of nursing at the breast and the assumed superior nutritive values of human milk contribute substantially more to fa-

cial development than does artificial feeding (8). Pottenger and Krohn showed by means of an anthropometrical study that persons who were not breast fed at all had the least amount of malar growth in the width of the face; those breast fed three months or less showed better malar growth; and those breast fed more than three months showed the best malar growth of all at the zygoma of the face. The biorbital and bimalar distances of the faces of the 327 subjects were measured by means of spreading calipers, but this method appeared to have certain limitations. It was found that two sets of measurements on the same person changed with the position of the body. Measurements taken when the subject was lying on his back differed slightly from those taken when the subject was sitting or standing. The physical condition of the person also was found to make a difference. The external skin covering the face, the fat pads, and the muscles all seemed to enter into the problem of securing accurate measurements by means of the spreading calipers.

It was thought that these limitations could be overcome by using the techniques of roentgenographic cephalometry. Most growth and development studies using these techniques have employed the lateral or posterior-anterior views. Neither of these views produces measurements needed for the width or breadth of the face in the areas of concern. Another view was therefore utilized, the sub-mental vertex (under the chin to the top of the head). (Fig. 1) This view was used exclusively in the present investigation.

METHODS AND TECHNIQUES USED

The subjects included 340 children and adults: 147 males and 193 females. They were within the postnatal limit of four and 76 years of age, were chosen from members of the white race, and were from professional and business classes which had similar economic status.

In this study, X-rays were taken from a basal position of the head of the subjects; then these radiographs were placed on a horizontal, luminated viewing table, (Fig. 2) and two sets of landmarks were studied and measured by a fine-pointed divider. The divider was then placed on a metric scale, read, and recorded. The control landmarks, the biorbital area, were the zygomatico-frontal sutures. The variable landmarks, the bimalar area, were the broadest portion of the zycoma (the long arch that joins the temporal and malar bones on the side of the skull) in the frontal aspect.

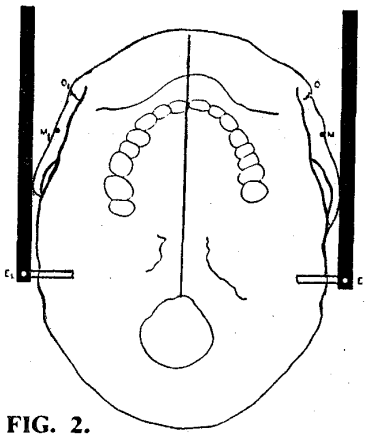

FIG. 2.

O-O, THE FRONTO-ZYGOMATIC SUTURE
M-M, THE BROADEST PART OF THE ZYGOMA WHICH CORRESPONDS ROUGHLY TO THE ATTACHMENT OF THE M ZYGOMATICUS

ANALYSIS OF THE DATA

The recorded measurements of the biorbital and the bimalar areas were divided into the following categories: (1) males — aged four through eleven, the period of changing and mixed dentition; (2) females—aged four through eleven; (3) males—aged twelve through twenty-five, the period of active general growth; (4) females —twelve through twenty-five; (5) males—twenty-six and over, the period of adulthood; (6) females —twenty-six and over. The data then were grouped into two additional categories—those subjects who were nursed at the breast, and those who were artificially fed.

In order to determine the strength of the relationships of these methods of feeding, the following factors were noted—the number of months of the type of feeding, measurement comparisons of the control area of orbital sutures and the malar prominences or variable area, and the sex of the subjects.

The measurement of the orbital sutures served as a control since that area enjoys the same nutritional and other influences as the malar prominences, but one great difference between the two areas exists. The great muscle of mastication, the masseter, attaches to the malar prominence, but no muscle attaches to the suture. The biorbital distance thus served as an aid in measuring the growth of the bimalar distance as influenced by the pull of this great muscle

A null hypothesis was set up indicating that the two methods of feeding are equally effective in producing equivalent growth and development of the malar prominences of the face. Chi square was chosen as the statistical tool to determine the strength of the relationships of the methods of feeding.

DISCUSSION OF THE FINDINGS

Method of feeding and the length of time fed. Of the 91 artificially fed infants, 58 were larger in the biorbital area, designated as X; 12 were the same in both areas, designated as Y; and 21 were larger in the bimalar region, designated at Z. As a group, more than half of those artificially fed were smaller in the malar area than in the control area. There were 249 subjects who were breast fed for a period of one month or more. Of these, 12 were broader at the biorbital area, X; 16 were the same in both areas, Y; and 221 were larger in the bimalar region, Z. Thus, an overwhelming number of the subject who were breast fed were broader at the malar prominence than at the control area. More specifically, it was found that no subject who was breast fed for a period of at least four months was larger in the control area, the biorbital sutures. These findings confirm the observations of Pottenger and Krohn (8).

Age groupings and measurements of the biorbital and bimalar region — artificially fed groups. The artificially fed infants were divided into two age groups, four through eleven years, the period of changing or mixed dentition, and twelve years or older, the period of permanent dentition. There were 52 subjects under twelve years of age; 39 were broader in the control area, X; 10 measured the same in both areas, Y; and only 3 were found to be broader in the bimalar region, Z. However, those subjects aged twelve or over presented a different picture. There were 19 who were broader in the control area, X; 2 measured the same in both regions, Y; and 18 were broader at the malar location, Z. Thus it was observed that although infants and children who were artifically fed were overwhelmingly larger in the control area, the biorbital sutures their faces tended to broaden as they grew older. Those in the twelve years of age or older group were about equally divided in the two areas of the biorbital and bimalar measurements. This seems to indicate that the malar prominences continue to grow after the period of mixed dentition, regardless of the method of feeding as an infant.

Age groupings and measurements of the biorbital and bimalar regions—breast fed group. Those subjects who were breast fed for four months or longer definitely showed that the exercise of that method of feeding made for a broader face. No subject was found to be larger in the biorbital area; 7 subjects were the same in both areas, Y, and 195 were definitely larger in the bimalar region. It seems reasonable to assume that if breast feeding does improve the growth of the malar prominences, and if there is definitely a growth relationship between palatal arch and bizygomatic arch as shown in the literature (10) (11) (12) (13) (14), then there should be more room in breast fed infants for the dental arch to expand, or vice versa in the case of artificially fed infants.

Salzmann (9) and Davenport (15) reported that most of the growth in height and width of the face occurs after the eruption of the first permanent molars. They also noted that when the deciduous dentition is completed and prior to the eruption of the first permanent molars, the transverse dimensions (width) of the face reach four-fifths of its completed adult dimension. It seems logical to provide the best opportunities for maximum growth in the width of the face before the period of changing dentition (six to twelve years of age) in order to prevent narrow dental arches, crowding of teeth, and malocclusion of arches.

FINDINGS

These findings tend to confirm the observations of Salzmann (9) and Ramaker (7) that breast feeding provides better opportunities for the exercise and development of the muscles of mastication.

In spite of the fact that most of the subjects were medical patients for nutritional deficiencies, allergies, or respiratory infections, all factors normally causing narrower faces (8), those persons who were breast fed more than three months showed excellent development of the maler prominences of the face. Thus it might be stated with confidence that (1) an infant gets more exercise from nursing at the breast than on a bottle; (2) this exercise so stimulates the malar prominences that growth in the width of the face of the breast fed infant is greater than in the artificially fed infant; and (3) these methods of feeding were not equally effective in influencing the growth and development of the malar prominences of the face.

Breadth of the face as influenced by sex of the subjects. Normally the bizygomatic width is less in the female than in the male (15). The sexual difference is just detectable at birth, increases slightly at the beginning of the sixth year in the girl, and thereafter appears to show no difference between the sexes until after age twelve. With the adolescent spurt of growth in the male, the difference between the sexes is increased slightly.

OBSERVATIONS

In this study, the measurements of 46 males and 45 females who were artificially fed were compared with the facial width categories, X, Y, and Z. It was found that 31 males were larger at X; 7 were the same in both areas, Y; and 8 were larger in the Z region; thus it was seen that the artificially fed males were predominantly larger in the biorbital area.

Of the females, 27 were larger at X; 5 were the same at Y; and 13 were larger at Z. In other words, there were more females broader at the bimalar area than there were males, but in both sex categories, more were broader in the biorbital region, and sex was not a significant factor in the proportions of the breadth of the face at the biorbital and bimalar areas as the type of feeding had been. It should be pointed out that although more girls were broader at the bimalar region than males, this does not mean that they were broader than the males. It merely indicates that the proportion was different, since no absolute measurements were compared.

The measurements of 249 subjects who were breast fed for at least a month were compared with reference to the three categories of width X, Y, and Z. It was found that 8 males and 4 females were broader at X; 9 males and 7 females were the same in both dimensions, Y; and 84 males and 137 females were broader at the malar prominences, Z. Thus it was apparent that sex played no part in determining the proportions of the breadths of the two areas measured, but that the method of feeding was the determining factor.

There is no way at this time to determine whether the superior growth of the malar prominences in the breast fed infants was due entirely to the effect of the exercise of nursing at the breast, or whether superior nutritive values of human milk entered into the situation. The superiority of human milk for human babies, because of the more desirable composition and proportions of nu-

trients which provide optimal osseous structures for the muscles of mastication, together with the exercise provided in the breast feeding offer the infant the proper building blocks for a more harmonious dento-facial complex.

CONCLUSIONS

In spite of the fact that most of the subjects were medical patients for ailments normally causing narrower faces, these persons who were breast fed more than three months showed excellent development of the malar prominences of the face. It might be stated with confidence that (1) an infant gets more exercise from nursing at the breast than a bottle, and this exercise so stimulates the malar prominences that growth in the width of the face is greater than in the artificially fed infant; (2) the methods of feeding were not equally effective in the growth and development of the malar prominences of the face; (3) the two sets of data are independent and significantly different, and cannot be explained by chance. It is apparent from these results that children who are bottle fed do not have optimum development of the facial region when the deciduous and permanent teeth are being erupted.

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