

Sex Differences in Maxillary Growth of Cleft Subjects

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Sex differences in cleft lip and palate are well recognized. Perhaps the most obvious sex difference is that in the manifestation of clefts. Several studies have shown that clefts of the lip with or without cleft palate occur more frequently in males, while isolated clefts of the palate occur more frequently in females (2, 4, 6, 8, 11). Other sex differences have been reported from time to time. Meskin and others (10) have pointed out that the works of Fogh-Andersen (4), Knox and Braithwaite (7), and Mazaheri (9) have shown that, in isolated cleft palate, females exhibit a greater proportion of the more severe clefts involving both hard and soft palate and a smaller proportion of the less severe clefts of the soft palate only than do males. Meskin and others (10) also found that in all types of cleft lip and palate the females exhibited a greater tendency to develop complete clefts and the males to develop incomplete clefts. Bimm and others (1), studying the length of the mandible in children with cleft lip and palate, found a consistent though nonsignificant tendency towards a reduction in length compared with normal mandibles, with females being more severely affected than males.

A previous study by the author (5) showed a further sex difference in cleft lip and palate. The length and position of the maxilla in 50 subjects with complete unilateral cleft of the lip and palate were compared with those of 50 normal controls matched for age and sex with the cleft palate group. It was found that there were significant differences between the sexes. In both sexes, the maxilla was shorter and more retroposed in the cleft subjects than in the controls, but the female cleft subjects differed more from the female controls than did the male subjects from the male controls. This suggested the hypothesis that in complete unilateral cleft of the lip and palate, maxillary growth in length is more adversely affected in the female than in the male. A further study was therefore set up to test this hypothesis.

Material and Methods

70 patients with complete unilateral clefts of the lip and palate formed the subjects of this study. There were 45 males and 25 females. Their

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TABLE 1. Age distribution of subjects.

| | <i>age last birthday (years)</i> | | | | | | | | | | | | | | | | | |
|---------|----------------------------------|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| males | 1 | 5 | 3 | 6 | 5 | 6 | 2 | 4 | 4 | 3 | 4 | 1 | — | — | 1 | — | — | — |
| females | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 4 | 3 | 2 | 2 | — | 1 | 1 | — | — | — | 1 |

TABLE 2. Age at palate operation for 61 of the 70 patients. Information about age of surgery was not available for nine patients.

| | <i>age in months</i> | | | | |
|---------|----------------------|---------------------|----------------------|----------------------|---------|
| | 0-6 | over 6, under 12 | over 12, under 18 | over 18, under 24 | over 24 |
| males | 2 | 8 | 17 | 12 | — |
| females | — | 2 | 12 | 7 | 1 |

ages ranged from 5 years to 22 years, and the age distribution is shown in Table 1. Surgical repair of the clefts had been carried out at various centers. The ages at which repair of the palate had been carried out is shown in Table 2 for those 61 patients for whom this information was available. It can be seen that there was no great difference between the sexes for the age at palate repair. Three of the male patients had had secondary palate operations, two at 3 years and one at 6 years of age.

The cleft palate group was compared with a control group of 70 subjects, each control being matched for age and sex with one of the cleft palate group. Thus the two groups could be treated as a series of matched pairs. The controls were chosen from patients attending dental clinics for regular treatment, the only criteria being the age, sex, and the fact that they had not been referred for orthodontic treatment.

Standardized lateral skull radiographs were taken of each subject and control, and the radiographs were traced and measured. Three measurements were made which are relevant to the size and position of the maxilla (Figure 1). These are as follows: 1. Length of maxilla. This was measured along the maxillary plane between a point where a perpendicular from 'A' point to the maxillary plane meets the maxillary plane and a point where a perpendicular from the lower end of the pterygo-maxillary fissure shadow to the maxillary plane meets the maxillary plane. The maxillary plane was taken as a line joining the anterior nasal spine and the posterior nasal spine. In order to assess the reliability of determination of 'A' point and the pterygomaxillary fissure shadow, the length of the maxilla was remeasured on 20 radiographs and the results

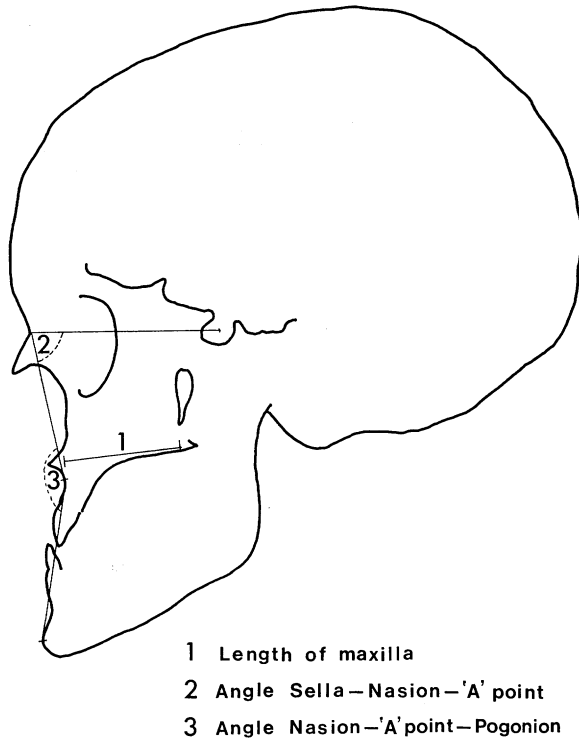


FIGURE 1. The measurements used for the assessment of length and position of the maxilla.

compared with the initial measurements by means of a paired *t* test. The mean difference between the two groups of measurements was 0.025 mm, which proved statistically insignificant ($P > 0.5$). 2. Position of maxilla. This was assessed from the angle Sella-Nasion-'A' point. 3. Facial contour. This was measured as the external angle Nasion-'A' point-Pogonion.

The points Sella, Nasion, 'A' point, and Pogonion were assessed as described by Downs (3).

Statistical analyses were applied to the results of the measurements. The mean values and standard errors of the means of each measurement were calculated for each sex. The significance of the differences between the cleft and control groups for each sex was assessed by means of a paired *t* test.

The differences between the sexes was then assessed using the *t* test applied to the differences between cleft and control groups of each sex.

Results

DIFFERENCES BETWEEN CLEFT AND CONTROL GROUPS. The mean values and standard errors of the means for the measurements of cleft and con-

TABLE 3. Mean differences between matched pairs from cleft and control groups.

| <i>males</i> | | | | | | |
|--------------------------|-------------------------|---------------------------|-------------------|---------------------------|---------------------------------------------------|-------------------|
| | <i>control mean</i> | <i>standard error</i> | <i>cleft mean</i> | <i>standard error</i> | <i>mean difference control- cleft</i> | <i>value of t</i> |
| length of maxilla in mm. | 48.51 | 0.54 | 46.53 | 0.42 | 1.98 | 3.11*** |
| angle S-N-A..... | 79.00 | 0.45 | 75.51 | 0.69 | 3.49 | 4.10**** |
| angle N-A-pogonion... | 185.23 | 0.83 | 182.93 | 1.10 | 2.30 | 4.88**** |
| <i>females</i> | | | | | | |
| | <i>control mean</i> | <i>standard error</i> | <i>cleft mean</i> | <i>standard error</i> | <i>mean difference control- cleft</i> | <i>value of t</i> |
| length of maxilla in mm. | 47.96 | 0.64 | 43.88 | 0.69 | 4.08 | 3.15*** |
| angle S-N-A..... | 79.32 | 0.80 | 73.36 | 0.71 | 5.96 | 4.64**** |
| angle N-A-pogonion... | 183.88 | 1.29 | 178.84 | 1.56 | 5.04 | 2.64** |

** Significant at 2% level.

*** Significant at 1% level.

**** Significant at 0.1% level.

trol groups for each sex, together with the differences between cleft and control groups, are shown in Table 3.

It can be seen from Table 3 that there were statistically significant differences for all three measurements between the cleft and control groups, the cleft subjects having the smaller measurements. This suggests that the maxilla is shorter and more retroposed and the facial contour more concave in subjects with complete unilateral clefts of lip and palate than in comparable noncleft subjects.

DIFFERENCES BETWEEN THE SEXES. Table 4 shows the differences between the cleft subjects and the control subjects of each sex assessed from the differences between each of the matched pairs. Table 4 also shows the difference between the results from the male and female matched pairs. It can be seen from Table 4 that the differences in the female matched pairs were greater than those in the male matched pairs for each measurement, although the difference only reached the conventional level of statistical significance for the measurement of maxillary length. Thus it seems that the female cleft subjects differed from the female controls more than the male cleft subjects differed from the male controls for the measurement of maxillary length. This supports the original hypothesis that in complete unilateral cleft of the lip and palate maxillary growth in length is more adversely affected in the female than in the male.

TABLE 4. Inter-sex differences of differences between the matched pairs.

| | <i>male</i> | | <i>female</i> | | <i>mean difference female- male</i> | <i>value of t</i> |
|----------------------------------|--------------------------------------------------------------|---------------------------|--------------------------------------------------------------|---------------------------|-------------------------------------------------|-------------------|
| | <i>mean difference between matched pairs</i> | <i>standard error</i> | <i>mean difference between matched pairs</i> | <i>standard error</i> | | |
| length of maxilla in mm. | 1.98 | 0.64 | 4.08 | 0.81 | 2.10 | 2.05* |
| angle S-N-A. | 3.49 | 0.87 | 5.96 | 1.28 | 2.47 | 1.59 |
| angle N-A-pogonion. | 2.30 | 1.32 | 5.04 | 1.91 | 2.74 | 1.18 |

* Significant at 5% level.

Discussion

The conclusion reached from the present study, that is, that the growth of the maxilla in length is more adversely affected in females than in males in complete unilateral cleft lip and palate, is open to several interpretations. As most of the subjects were children who were still growing, the reduced size of the maxilla in females could be due to either a reduction in growth potential or to a retardation in growth, so that full potential, though not reduced, is reached at a later age. The latter suggestion is contrary to the findings of Osborne (12). He found in serial study of 25 cleft lip and palate subjects that facial growth in the females was mainly completed by 12 to 14 years of age, while, in the males, facial growth continued through to at least 16 years of age.

If there is a greater reduction in growth potential in the maxilla of females than of males, this could be due to genetic or environmental influences. As mentioned previously, several authors have pointed out the tendency for females to develop a higher proportion of the complete clefts than males (4, 7, 9, 10). The present study only included subjects with complete clefts of both sexes. However, even within the category of complete clefts, there is room for a wide range of severity, both in the degree of tissue deficiency and in the malpositioning of the various parts of the jaw. It may be that the female tends to develop a more severe complete cleft than does the male.

There is little evidence about environmental factors which could cause a difference in growth potential of the maxilla between the sexes, although environment differences may exist. For example, Steigler and Berry (13) found that iron-deficiency anemia in pregnancy had affected 20% of the mothers of females with clefts of the lip and palate, but only 10% of the mothers of males.

Thus, although there is evidence that maxillary growth in length is more reduced in females than in males with complete cleft lip and palate, the cause of such reduction remains obscure.

Summary

70 subjects with complete unilateral clefts of the lip and palate were compared with 70 normal controls, each control being matched for age and sex with one of the cleft subjects. There were 45 males and 25 females in each group. Cephalometric assessment revealed statistically significant differences between the cleft and the control groups for measurements of the anteroposterior length and position of the maxilla, the cleft group exhibiting the smaller and more retroposed maxillae. The length of the maxilla was more reduced in the female cleft subjects than in the male cleft subjects when compared with the normal controls in an analysis of the matched pairs. The difference was statistically significant, suggesting that maxillary growth in the females is more severely affected than in the males in complete cleft of the lip and palate.

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