Center for Craniofacial Anomalies, University of Illinois at the Medical Center, Chicago, Ill.

Twins With Clefts

S. Pruzansky, M. Markovic, D. Buzdygan

The concurrence of two experiments of nature, twins and congenital birth defects, provides a unique population for the elucidation of nature-nurture questions. Although the concurrence of twins with clefts is not common, their frequency in the aggregate of international reporting is sufficient to allow for meaningful studies.

In a recent conference on the genetics of cleft lip and palate, Fraser (1968) summarized the state of knowledge regarding etiology. The following quotation from his report is pertinent to the present paper:

1) In the majority of cases, cleft lip or cleft lip and palate [CL(P)] represents a quasi-continuous variant, or threshold character of multifactorial etiology. For cleft palate [CP] there is less convincing information;

2) Observations on arch form, face shape, body asymmetries and developmental variables suggest that such variants may underly the predisposition to clefts;

3) Twin studies may be useful in identifying the physiognomic factors predisposing to facial clefts.

With these concepts in mind, we initiated an analysis of 19 twin pairs selected from the continuing longitudinal growth study which began at our Center in 1949 (Pruzansky and Lis, 1958).

Review of the literature indicated that no single investigation had managed to collect a large population of twins with clefts. Fogh-Andersen's personal sample of 27 twins (1942), for which zygosity testing had been completed, is probably the largest to date.

Though our series is small, it presents two unique qualities. Most of the cases were examined prior to the intervention of surgery and were followed longitudinally. The accumulated dental casts, photographs and cephalometric X-rays, among other data, form the basis of our preliminary report.

Estimates of zygosity were based on serologic traits (ABO, MNS, Rh, P, Kell, Lewis, Duffy, Kidd, and Luther) and the degree of physical resemblance between the twins. Physical resemblance included such traits as sex, hair and eye color, hair form, shape of ears, skin pigmentation and facial conformation. Parental blood typings were not completed. In one set of twins, the probability of monovular origin was further confirmed by successful reciprocal skin grafts.

This investigation was supported, in part, by grants from the National Institutes of Health (DE 02872) and the Children's Bureau, Dept. of Health, Education and Welfare.

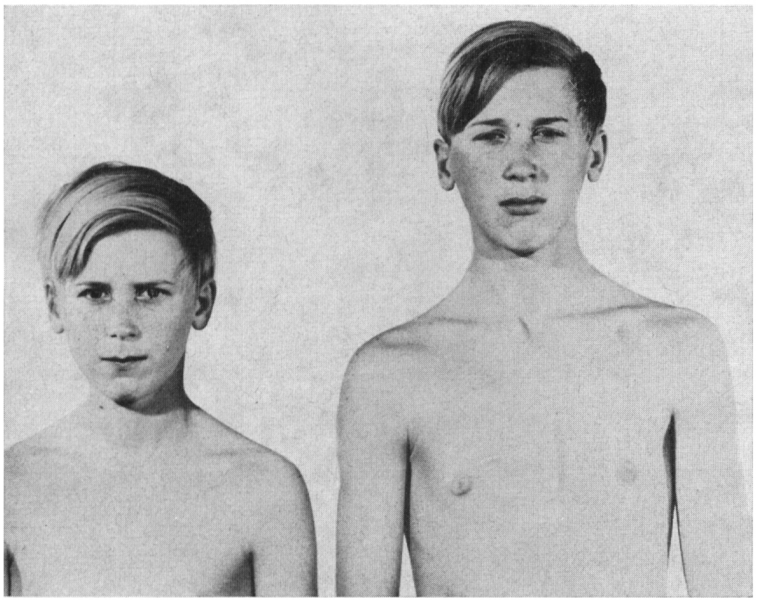

Fig. 1. MZ male twins (325 and 326) concordant for cleft palate, at age 16-6.

On the basis of our tests for zygosity, the probability of monozygosity in 7 twin pairs seems to have been reasonably established, while dizygosity was certain in 10 pairs.

For the sake of brevity, we shall highlight several findings by reference to several selected twin pairs in our series.

Twins 325 and 326 (Fig. 1) were the full term product of the 4th pregnancy. The shorter twin (165 cm) was the first-born and weighed 48 kg; his cotwin was taller (183 cm) and weighed 58 kg.

They were concordant for cleft palate, though the extent of the cleft was not identical (Fig. 2). Ear shape was similar, as was the occlusion and tooth form (Fig. 3).

Tracings of the total craniofacial complex revealed lower concordance for the neurocranium in infancy than at adolescence, but greater concordance in the midface at an earlier than at a later age (Fig. 4).

In presenting our tracings from lateral cephalometric X-ray films, we hasten to acknowledge the caution introduced by Kraus et al (1959) that the craniofacial complex is not amenable to hereditability study by means of the twin method. We share their reasoning that the craniofacial complex, and the various angular and polygonal constructs, commonly utilized to measure craniofacial morphology, cut across a network of highly independent variables and do not represent units of inheritance. Further, we agree that the profile of a single bone, or segment of bone, possesses the virtue of being closer to reflecting the operation of a single system of growth regulation.

Nevertheless, as a first step, we decided to test the value of comparing tracings of the total facial complex. The availability of serial records added the dimension of growth to the analysis of the twins.

Twins 788 and 797 illustrate that concordance for clefts may be overlooked in the case of a microform of cleft palate in one of the twins. These are Chinese twins concordant for

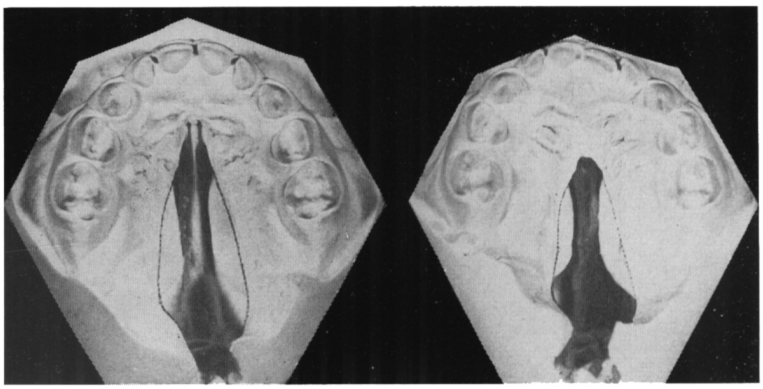

Fig. 2. Casts of twins 325 and 326 at age 3-3. Note difference in anterior-posterior extent of the cleft.

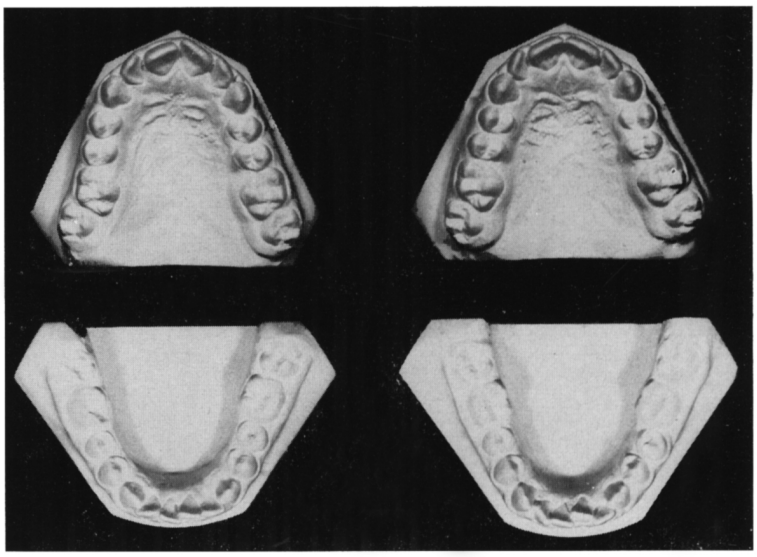

Fig. 3. Occlusal view of dental casts of twins 325 and 326 at age 13-1.

glaucoma, among other traits. One presented an obvious cleft of the soft palate; his cotwin had a bifid uvula and submucous cleft palate — defects which are rarely diagnosed at birth.

Conversely, discordance for clefts may be missed, as in the case of female MZ twins 524 and 524N. A diagnosis of congenital palatopharyngeal incompetence was made following unmasking of the defect by adenoidectomy. The cephalometric tracings revealed concordance in the shape of the craniofacial complex, but not in the length and thickness of the soft palate. The latter was decidedly smaller in the affected twin (Fig. 5).

In contrast to MZ twins, DZ twins, whether of same or different sex, demonstrated greater discordance in the shape and size of the craniofacial complex (Figs. 6, 7).

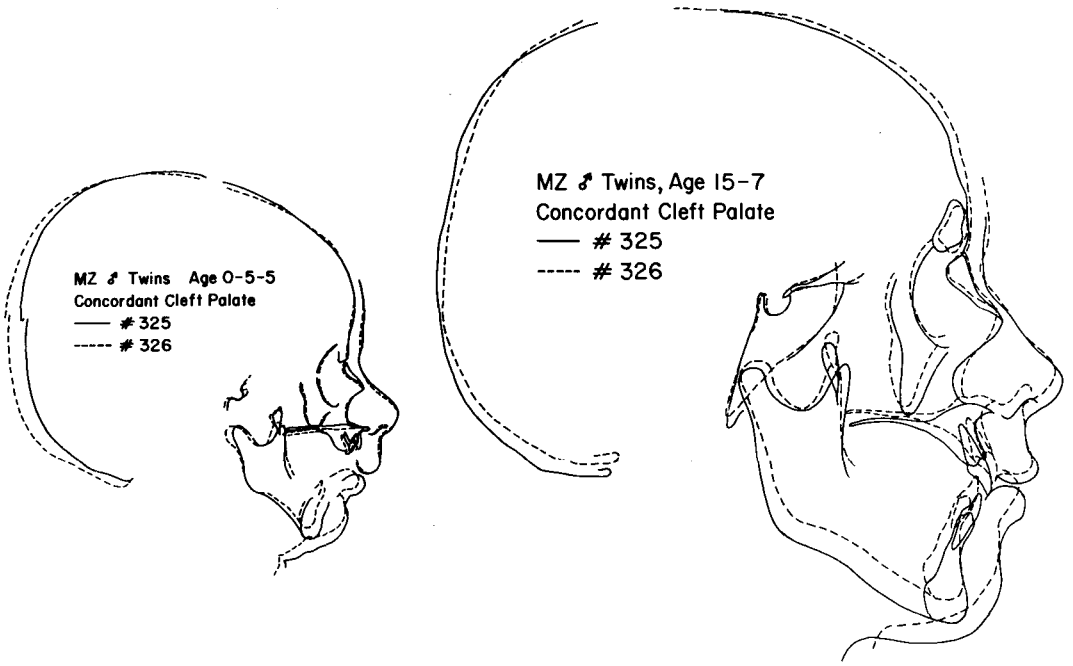

Fig. 4. Superimposed tracings of roentgencephalometric films taken at different ages

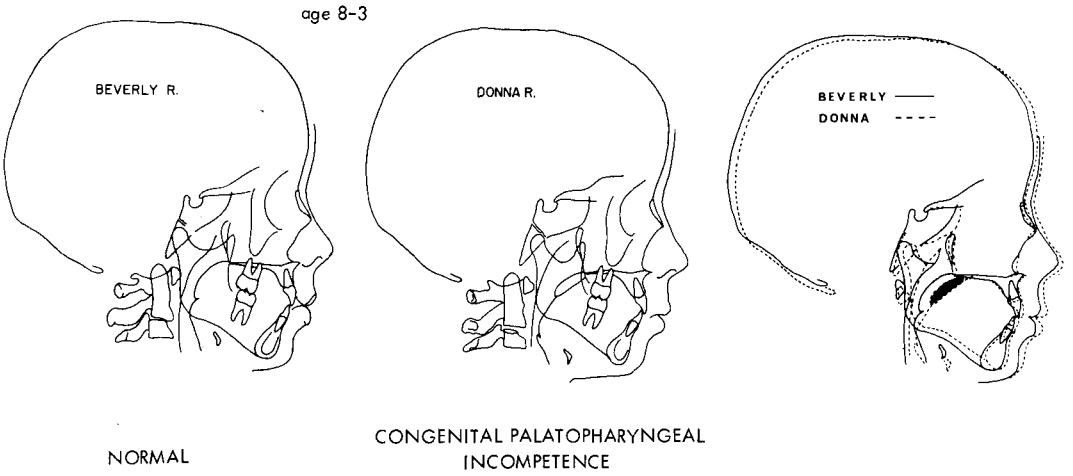

Fig. 5. Superimposed tracings of MZ twins discordant for cleft palate

https://doi.org/10.1017/S1120962300025518 Published online by Cambridge University Press

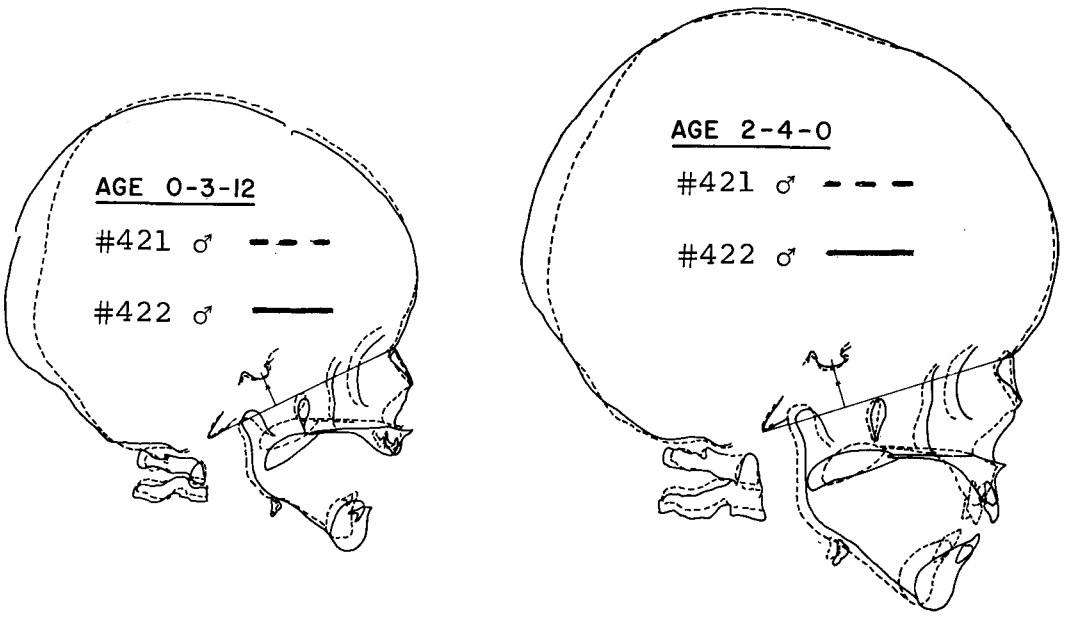

Fig. 6. Superimposed tracings of DZ same-sexed twins.

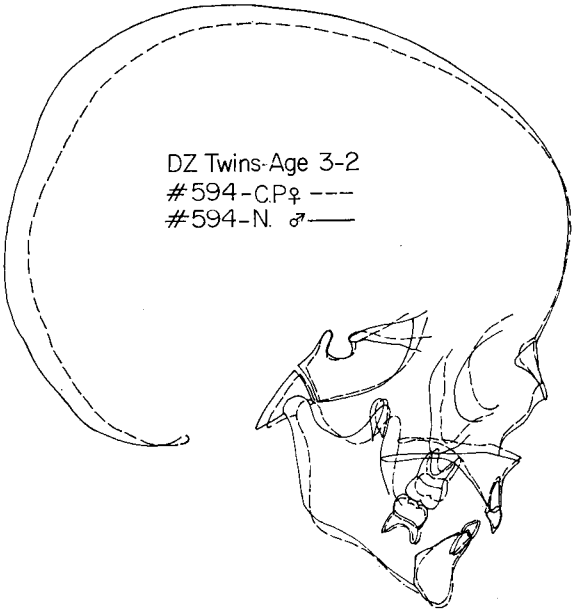

Fig. 7. Superimposed tracings of DZ opposite-sexed twins.

https://doi.org/10.1017/S1120962300025518 Published online by Cambridge University Press

The following results emerge from our preliminary review of the data:

1) Of 9 MZ twins, 4 were concordant for CLP, 3 were concordant for CP, and 2 were discordant for CP;

2) Of 10 DZ twins, 6 were discordant for CLP, and 4 were discordant for CP;

3) While the numbers are small, they support a previously noted trend for greater concordance among CLP than CP;

4) Clefts among concordant twins are seldom identical;

5) Concordance in craniofacial structures is greater for MZ than DZ twins. Serial records suggest variation in degree of concordance at different ages;

6) Microforms may affect judgment of concordance.

The finding of a greater concordance for clefts among MZ twins in our series, than had been previously reported in the literature, must be viewed with caution. There is a recognized bias of greater referral of concordant pairs to University Medical Centers. Therefore, our sampling is not necessarily representative of the population of twins with clefts.

References

Fogh-Andersen P. (1942). Inheritance of Harelip and Cleft Palate. Nyt Nordisk Forlag, Copenhagen.

Fraser F. C. (1968). Genetics of cleft lip and cleft palate. Conference held at the National Institute of Dental Research, 1968.

Kraus B. S., Wise W. J., Frei R. H. (1959). Heredity and the craniofacial complex. Amer. J. Orthodont., **45**: 172-217.

Pruzansky S., Lis E. F. (1958). Cephalometric roentgenography of infants: sedation, instrumentation and research. Amer. J. Orthodont., **44**: 159-186.

S. Pruzansky, D.D.S., Center for Craniofacial Anomalies, University of Illinois Medical Center, P.O.Box 6998, Chicago, Ill. 60680, USA.