Nager Acrofacial Dysostosis: Early Intervention and Long-Term Planning

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Nager acrofacial dysostosis is an extremely rare *syndrome* combining *craniofacial features* similar to Treacher Collins mandibulofacial dysostosis with the additional features of *thumb* and *radial bone hypoplasia*. The clinical and prognostic aspects of two unrelated infants with Nager acrofacial dysostosis are presented. A vigorous *early intervention* program of habilitation is described with emphasis on the facilitation of speech and language development in children with multiple morphological and developmental problems.

Syndromes involving oromandibular-limb hypogenesis can be classified into relatively few entities (Hall, 1971). In the past there were some attempts to include the Treacher Collins syndrome within this category since an occasional patient with Treacher Collins syndrome had limb reduction defects. Gorlin et al. (1976) have suggested consideration of "mandibulofacial dysostosis as a nonspecific symptom complex that may occur in several different disorders, the most common being the Treacher Collins syndroms." Recently, McKusick (1975) differentiated between Treacher Collins and a similar but different disorder originally described by Nager and de Reynier in 1948. Patients with this type of Nager acrofacial dysostosis consistently had preaxial limb hypogenesis but also had facial features remarkably similar to patients with the Treacher Collins syndrome. Most patients previously reported as having the Treacher Collins syndrome and preaxial limb hypogenesis probably had Nager acrofacial dysostosis. Separation of these two entities is important since the Treacher Collins syndrome is clearly inherited as an autosomal dominant disorder while the inheritance of Nager acrofacial dysostosis is not yet established (Walker, 1974). At least 16 cases of Nager acrofacial dysostosis have been identified (Nager and de Reynier, 1948; Franceschetti and Klein, 1949; Fernandez and Ronis, 1964; Jones, 1968; Pfeiffer, 1969; Klein et al., 1970; Walker, 1974; Bowen and Harley, 1974;

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Hermann et al., 1975; Smith and Jones, 1975; Pashayan and Feingold, 1975; Wildervanck, 1975). We describe below two additional patients with Nager acrofacial dysostosis and document the many difficulties such children can experience.

Case Report I (MV)

GENERAL MEDICAL HISTORY. MV was the product of a normal 42-week gestation. At birth she weighed 2950 grams, was 48 cm long, and had a 33 1/4 cm head circumference. Her caucasion father and mother were 37 and 31 years-of-age respectively. MV has two paternal half-siblings and two maternal half-siblings. The family history is negative for any related abnormalities, and there is no consanguinity.

Physical examination revealed a child in moderate respiratory distress because of glossoptosis. The small ears were well-formed but the external auditory canals were tiny and malformed. The lower-lid eyelashes were sparse laterally and absent medially. A downward eye slant was associated with marked malar bone hypoplasia. Slightly upturned nares were present. The prominent philtrum was long and simple, probably because of the marked maxillary gingival prominence and/or hyperplasia. Marked micrognathia with glossoptosis and poor jaw excursion was present. The extremities showed radial angulation of the hand at the wrist, absence of the right thumb, hypoplastic left thumb, mild macrodactyly and radial clinodactyly of the index fingers, absent distal flexion crease of the index fingers, bilateral fourth and fifth toe overriding of the third toe, and absent distal flexion creases on all toes. Poor sucking ability necessitated tube feedings for approximately seven months during which time she was confined to an extended care facility.

MV grew poorly with height and weight falling in the third percentile. She was able to lift her head at three weeks and roll over at four months. Despite socialization at four months, she was considered slow by the professionals caring for her. When she was five months old, a moderate bilateral conductive hearing loss was identified, and hearing aids were fitted. A left hip dislocation was diagnosed at 9 and a half months. Walking did not occur until 18 months. Head circumference at 21 months was at the third percentile (45 cm), and weight was at the 50th percentile for a six month-old (7 kg.). Her general health has been excellent, and she remains mentally within normal limits but delayed in physical development. The only progressive problems are pectus excavatum and limitation of elbow and knee movement.

SPEECH, HEARING AND LANGUAGE ASSESSMENT AND REMEDIATION. English Sign Language was initiated concurrently with the fitting of the hearing aid to insure maximal language input. The nursing staff was reminded of the importance of speaking and signing to the infant during all contacts and were taught a number of simple signs. The parents and siblings were similarly instructed in preparation for the move home at age seven and a half months.

Receptive and expressive language skills developed slowly but in a predictable pattern. Improved responses to auditory stimuli prompted the mother to discontinue signing. By 20 months of age, MV identified body parts, followed simple commands, and approximated several words. A developmental screening test administered when she was 23 months old indicated that she was functioning close to normal levels. A language scale, however, revealed mildly depressed receptive scores and a significant expressive deficit. Audiological evaluations revealed pure tone thresholds and response to monitored live voice and music at 60–65 dB. With the use of her bone conduction hearing aid, MV responded at 30 dB, indicating that she was benefitting significantly from amplification.

Case Report II (JW)

GENERAL MEDICAL HISTORY. JW was born after a 42-week gestation complicated by first trimester cramping which was treated with four injections (50 mg each) of medroxyprogesterone acetate, one each week from the fourth through the eighth week of gestation. For unknown reasons the mother was also on 25 mg q.d. daily of thryoid throughout pregnancy. JW weight 3380 grams and was 53 cm long. His caucasian parents were both 26 years old at the time of his conception and were not consanguinous. There are two maternal half-sisters. The family history is negative for any related abnormalities.

Physical examination revealed a child in severe respiratory distress secondary to glossoptosis. This problem was subsequently treated via a tracheotomy tube which was to stay in place for the following eight months. His cranium had a prominent right occipital bulge and wide bifrontal diameter. The small retroverted ears had narrow external canals. His facial features were similar to those of Case Report I with the exception of mild asymmetry. Extremity abnormalities included mild bilateral hypoplastic radial bones, reduction of full elbow extension (worse on the right), bilateral thumb hyoplasia, bilateral camptodactyly and clinodactyly of the index and fifth fingers with poorly developed distal flexion creases, thin fingers, and bilateral tibial clinodactyly of the fourth toe.

JW initially had significant problems feeding, necessitating a nasogastric tube which was used for five months. Pneumonia required a one-week hospitalization at four months. His general health since that time has been good although his growth (height and weight) has been below the third percentile. His head circumference has remained at the tenth percentile. At four months of age, a moderate conductive hearing loss was diagnosed, and hearing aids were fitted. JW has had significant delay in psychomotor milestones through his first fifteen months of life.

SPEECH, HEARING, AND LANGUAGE ASSESSMENT AND REMEDIATION. Although JW began to phonate at one-month of age, a tracheostomy performed at five weeks halted phonation for several months. Receptive

language growth was encouraged through a combination of auditory training, English Sign Language, and consistent speech models. The utilization of sign language was de-emphasized as listening behavior improved. At age 16 and a half months JW responded to monitored live voice, music, and narrow band noise (500–4000 Hz) at 55–60 dB and at 30 dB with amplification.

A developmental screening test administered at 16 months revealed significant delays in both motor and language milestones. A language scale indicated moderate receptive lags and major expressive delays. He responded appropriately to simple commands but demonstrated little verbal behavior.

Discussion

Two unrelated infants born within several months of each other in a western agricultural community were diagnosed as having Nager acrofacial dysostosis. The infants exhibited many of the features found in Treacher Collins mandibulofacial dysostosis, the primary additional features being thumb and radial bone hypoplasia which, in combination with craniofacial features, constitute Nager acrofacial dysostosis (Figure 1). The genetics of this extremely rare syndrome are poorly understood. One published family with affected male and female siblings suggests an autosomal recessive mode of inheritance (Walker, 1974). However, those two siblings were less severely affected than the 14 other isolated cases reported in the literature. The first trimester exposure of patient two to steroids raises the question of a drug etiology in some cases of Nager

FIGURE 1. MV (Patient 1) is on the left and JW (Patient 2) is on the right. The facial and limb features as described in the text are obvious.

acrofacial dysostosis. One of our patients and a number of cases in the literature have had normal karyotypes. Consequently, a chromosome etiology is unlikely. Judging from the variability of clinical expression, one must consider heterogeneity of etiology for Nager acrofacial dysostosis.

Extreme difficulties existed for both affected children during their first 9 months of life. Respiratory distress and feeding difficulties were considered serious problems. Poor growth has been present in both children, a complication present in one of the literature cases (Bowen and Harley, 1974). With all these problems and an apparent delay in some psychomotor milestones, observers were often prejudiced into thinking the children were slow. There was no reason to make this assumption since none of the literature cases has been mentally retarded. Reinforcement of this fact to the professionals dealing with the children was constantly necessary in order to keep their efforts opimal and insure that MV and JW would attain their full potential. A vigorous and immediate program of habilitation was initiated and has been maintained since the children's ultimate prognosis appeared to be dependent upon early intervention.

Because so little data are available on the reported cases of Nager acrofacial dysostosis, the types of language, speech, and hearing problems that were anticipated were those exhibited in patients with Treacher Collins mandibulofacial dysostosis which Nager closely resembles. It was suspected that the children would have at least mild and perhaps severe hearing losses and a lack of early and successful prespeech functions. Body-type aids were provided, and all individuals dealing with the children were counseled in providing maximal language stimulation. Total communication combining speech, amplification, and English sign language were utilized and demonstrated to those who provided primary care for the infants. As the hearing thresholds of the children appeared to approximate only mildly depressed levels, sign language was de-emphasized.

Language delays in children with craniofacial anomalies are frequent. Hearing loss is certainly contributory. Additional health and care problems generated by the unusual physical characteristics could also affect language development. Articulation disorders secondary to deviant morphology have been described by Bloomer (1971), Massengill (1971) and Peterson (1973), among others. Although MV and JW have little expressive language to date, they exhibit "muffled" voices which may well be the result of vocal tract crowding because of hypoplasia. Their micrognathia may influence oral and lingual mobility when speech occurs, but it is recognized that compensatory adjustments are frequent. Individual problems that the children may exhibit in the future will be studied with consideration of a number of causal factors, not just the obvious expressions of the syndrome but possible covert organic problems or psychological and developmental ones.

With consistent parent counseling and language stimulation, the existing developmental lags for both children are disappointing. Nevertheless, a number of professionals viewing the children from different disciplinary frameworks continue to be encouraging about their potentials.

The weekly stimulation and counseling visits have represented a consistent intervention program and will be supplanted by daily special preschool classes in which the children are already enrolled. Semiannual evaluations by the authors are planned. Dental and plastic surgery consults have given direction to the families for on-going hygiene and planning for orthodontic and surgical intervention. Additional consultation with a number of concerned professionals has facilitated a plan of long-range evaluation and remediation for these two patients presenting Nager acrofacial dysostosis.

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