Facial Deformity: A Preventable Disease?

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The history of medicine and dentistry is replete with examples of early remedies falling into disuse, only to be rediscovered many years later. Digitalis,[7] the modern drug that regulates heartbeat, is derived from the leaves of the purple foxglove, a plant that Welsh herb doctors used in the Middle Ages to treat dropsy. Rauwolfia,[6] a snake root used as a sedative in ancient India, has been used in recent times to control blood pressure. Quinine,[6] a derivative of tree bark, was first used against malaria by Indians of South America centuries ago. Headgear was first used for dental protrusion in the middle of the 19th century.[9] It fell into disuse until 100 years later when Oppenheim[16] espoused its advantages. Early teachers[2,23] in orthodontics believed that the adenoid face was a result of mouthbreathing. Later this concept was largely ignored by clinicians. Only recently has the idea that nasal airway obstruction can produce a characteristic facial deformity received renewed currency. Yet many researchers and clinicians continue to deny the possibility. Miller,[14] in a widely quoted study of 600 college students, concluded there was no difference in incidence of malocclusion between a group of allergic and nonallergic individuals. A weakness of this study was that it was based on a questionnaire to determine allergic status.

Horowitz and Hixon[10] in their textbook conclude that objective measurements have not substantiated the hypothesis that mouthbreathing is a causal factor in orthodontic anomalies.

Ricketts[20] in 1968 used the term Respiratory Obstruction Syndrome to describe the constellation of findings seen in mouthbreathers. Subtelny[22] has published extensively on the subject of the influence of disease of the tonsils and adenoids on facial growth. Marks,[13] an allergist, reviewed the arguments on both sides and concluded that nasal obstruction was a significant cause of altered facial growth. Quinn[18] has assigned nasal airway obstruction as the major cause of mandibular prognathism, facial asymmetries and vertical dysplasias. Linder-Aronson's[12] study, *Effects of Adenoidectomy on the Dentition and Facial Skeleton Over a Period of Five Years,* showed that, in a group of postadenotonsillectomy patients who became nasal respirators, there were significant craniofacial changes toward normalization, while the persistent mouthbreathers and the unoperated controls showed no changes.

A recent development that has focused the profession's interest on vertical dysplasias is the introduction of the LeFort I down-fracture with intrusion of the maxilla. This procedure, pioneered by Bell,[5] permits the orthodontic-oral surgery team to correct the high angle deformity by promoting counterclockwise rotation of the mandible through intrusion of the maxilla. Many clinicians believe that these corrections will remain stable only if the etiology is remedied.

Some questions remain. What are the causes of nasal airway obstruction? Is nasal obstruction a significant cause of malocclusion and facial deformity? What is the likelihood that a patient with nasal obstruction will develop facial deformity? And can the nasal airway be kept open throughout the years of facial growth?

In enumerating the causes of facial deformity it is clear that there are genetic and nongenetic causes. Monozygotic twins provide proof that both fac tors can exist in the same deformity,

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for example, cleft lip and palate. There is a greater incidence in the second twin when the first twin has a cleft lip or palate. But in many cases one twin is unaffected while the other has a cleft.[10]

To understand the nongenetic causes it is vital to begin with the prenatal period. Fetal studies reveal that the lip fuses between the 5th and 7th week of gestation and the palatal halves join during the 7th and 12th week.[10] This suggests that during the first trimester all influences that have been shown to adversely affect the fetus should be avoided. Besides good nutrition, all drugs and medications should be eliminated if possible. Nicotine, caffeine, aspirin, dilantin and Valium should be regarded as strong drugs that can interfere with the fusion of the maxillary and palatal processes. A portion of the reported increased incidence in cleft lip and palate has been attributed to the widespread use of Valium, currently the most prescribed drug in the United States. The recent report by Bandman et al.[3] that the presence of diazepam (Valium, Roche) in chicken embryo myoblasts arrests normal muscle cell differentiation may explain the phenomenon.

Postnatally, what can be done to promote optimal facial growth? Early feeding habits are extremely important.

Sixty years ago Paul Gyorgy[4] said, "Human milk is for the human infant; cow's milk is for the calf." An anonymous pediatrician is reported to say, "Cow's milk is good for children, if it doesn't hurt them." It has been estimated by Oski,[17] head of pediatrics at N.Y. State University at Syracuse, that 25% of children who drink cow's milk before age 6 months will develop one or more allergies and related problems.

The major cause of nasal obstruction during the first six months of life is food allergy and the most common allergen is cow's milk.[21] The newborn alimentary tract is porous to large molecules and cow's milk contains four times as much large molecular protein as human milk. Human milk contains IgA antibodies that confer protection against bacterial and viral infections in the newborn, whose IgA production is very low at birth.[15] Viral encephalitis is a serious disease that frequently attacks the cranial nerves of the infant.

Fig. 1 Facial deformity secondary to viral encephalitis.

Figure 1 shows a child with a serious facial deformity secondary to viral encephalitis during the first year of life. All of the cranial nerves except VI were damaged. There is no innervation to the muscles of mastication or facial expression.

Fortunately, breastfeeding is becoming more popular in America. The contents are better for the child and so is the container. The breast promotes development of the mandibular elevators, as it is necessary to bite the nipple to extract the milk from it.[1] It can be

shown that underutilization of the elevators of the mandible can result in high angle malocclusion and facial deformity. Cerebral palsy patients have a characteristic long face and open bite possibly resulting from the reduced nerve supply to their muscles. Typically, the artificial nipple permits the milk to flow too fast and keeps the jaws apart. The natural nipple flattens in use permitting the jaws to function closer together.

The newborn is an obligatory nasal respirator. If choanal atresia is not diagnosed promptly after birth, it is life threatening, because the baby is unable to breathe through the mouth. Yet by age two a significant number of children are mouthbreathers.

When the mandible is lowered and the lips are parted to permit mouthbreathing, there are several alterations to the force system acting on the facial skeleton.

1. The tongue assumes a lower position in the oral cavity denying the palate and maxillary alveolus their support.

2. The lower lip drops away from the labial surface of the maxillary incisors.

3. The mandible may fail to contact the maxilla on deglutition permitting unrestrained vertical alveolar development and posterior tooth eruption to occur.[19]

4. The elevators of the mandible may undergo atrophy because of underutilization. This may be compounded by edema and venous stasis if the cause of the airway obstruction is allergy.

The resultant findings may include: a) long face, b) anterior open bite, c) high palatal vault, d) gaping expression, e) inflamed anterior gingiva, f) steep mandibular plane, g) Class II malocclusion, and h) distress when lips are held together.

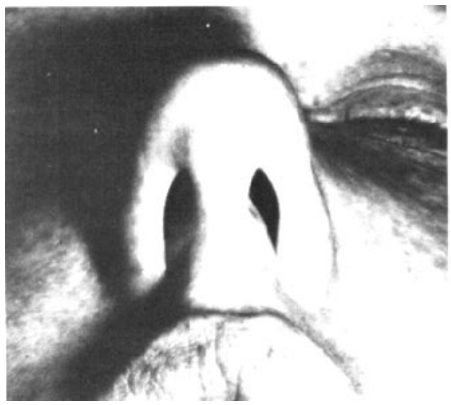

Fig. 2 Hypoplastic external nares.

The increased incidence of Class II malocclusion in mouthbreathers is caused by the clockwise rotation of the mandible secondary to the elongation of the posterior alveolus and tooth eruption.

The etiology of nasal airway obstruction may be congenital, acquired or developmental. The congenital causes include choanal atresia, which can be bony or membranous, and hypoplastic external nares (Fig. 2).

The acquired and development causes are: 1) deviated septa, 2) extensive nasopharyngeal lymphoid tissue, 3) perennial allergic rhinitis, 4) neoplasms, 5) polyp formation, 6) trauma, and 7) iatrogenic.

The panoramic headplate, a tomograph made at the level of central incisors, can be helpful in assessing deviation of the nasal septum (Fig. 3). Direct examination with a nasal speculum is essential. Deviation is invariably accompanied by hyperplasia of the turbinates on the concave side.

The lateral headplate is very valuable to the orthodontist in evaluating tonsillar and adenoid tissue (Fig. 4). Direct examination is important also.

Perennial allergic rhinitis is probably the most common cause of nasal airway obstruction. The history of more than

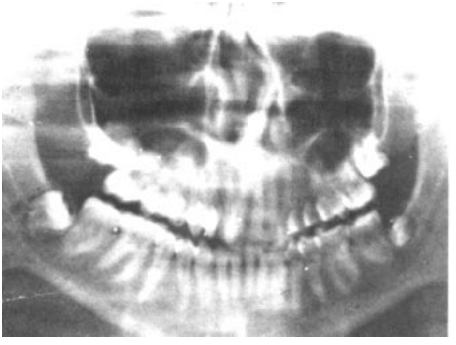

Fig. 3 Panoramic radiograph showing markedly deviated nasal septum.

Fig. 4 Lateral headplate showing extensive adenoid tissue and tonsils.

four to six colds per year suggests strongly the presence of allergy. The frequent rubbing of the nose (nasal salute) (Fig. 5), allergic shiners (dark shadows under the eyes), and vacuous facial expression reinforce the diagnosis.[21] An elevated eosinophil count in nasal smear is positive for allergy, although cell count is unreliable in infants.[8] The other causes of nasal obstruction are rare.

The treatment of nasal obstruction because of deviated septum is surgery. Carefully done, there is no danger to

Fig. 5 Allergic salute.

midface growth. Frequently, a partial turbinectomy is necessary at the same time.

An adenotonsillectomy is indicated if lymphoid tissue is causing nasal airway obstruction. Rapid maxillary expansion can increase the capacity of the nasal airway.

The treatment of perennial allergic rhinitis is medication, removal of allergens, and desensitization.

Retrospective studies have suggested that the newborn's allergy mechanism is immature at birth and that, if allergic episodes can be prevented in the first year of life, the child may avoid progressively severe allergic manifestations later on.[13,21] This finding, if substantiated, holds hope for children born of allergic parents. If both parents have allergic histories, the child is estimated to have a 70% chance of allergy. If one parent is allergic the probability falls to 50%.[8] Possibly, preventive allergic management could help minimize

the course of allergy in these patients.

Some preventive steps are:

1. Breastfeeding.

2. Avoidance of cow's milk with familial allergic history.

3. Delayed introduction of foods. Next to milk, orange juice, eggs and cereal are the most common allergens in infancy.

4. Proper humidification removes house dust from the air, especially during cold weather when indoor humidity can fall to 10% (40% is ideal). After the first year of life, airborne particles are the major cause of allergy in children.[21]

5. Desensitization with prepared injections along with avoidance of allergens can be effective in restoring nasal respiration in cases of perennial allergic rhinitis. Vasoconstrictor drops or sprays should not be used because there is a rebound promptly after their application.[21]

Summary and Conclusions

By training, the orthodontist is uniquely qualified to be the primary monitor of facial growth. He should assess the mode of respiration at approximately two years of age and confer with the pediatrician, allergist and otolaryngologist to institute appropriate medical management of any developing problems. He must educate his colleagues in medicine and dentistry to recognize those conditions that can produce facial deformity. The primary care physician should appreciate that obstruction of the nasal airway is an important dysfunction. Medical and surgical intervention and, above all, good preventive management must be instituted to promote patency of the nasal airway. Allergy is a disease of modern man. It is possible that better prenatal care, breastfeeding, the avoidance of common allergens, and appropriate surgical and medical management to reduce the incidence of respiratory obstruction in growing children will result in fewer cases of cleft lip and palate and other craniofacial anomalies.

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