ADENOID FACIES.*

CEDRIC A. QUICK, M.D., F.R.C.S.E.,
Minneapolis, Minn.,
and
KARSTEN K. H. GUNDLACH, M.D., D.D.S.,†
Hamburg, West Germany.

INTRODUCTION.

The appearance of a sniffling child with a blank expression, pinched nose and gaping mouth is so characteristic that it has earned the description, "adenoid facies." This implies that the essence of this problem is adenoid hypertrophy. However, mouth breathing may be associated with other causes for nasal airway obstruction. Of itself the symptom of nasal obstruction in children is quite often of considerable concern to parents because it leads to the social embarrassment of nasal sniffling and noisy eating habits. From a medical point of view, it is known that disturbances of nasal physiology resulting from nasal obstruction can lead to problems in the ears, paranasal sinuses, throat and cause increased dental disease. In the young child, if congenital clefting and allergic problems are excluded, the main cause of poor nasal airway is probably adenoid hypertrophy. However, after the age of nine or ten, adenoid hypertrophy usually becomes less significant.

In older children and adolescents it has been noticed that symptoms related to nasal obstruction are often seen in association with a high arched palate.[1-7] Over the years many theories have evolved to explain this phenomenon. Some authorities feel that the presence of hypertrophied adenoids early in life could affect the palatal growth.[8] Contrary views have also been expressed, stating that the high arched palate leads to adenoid hypertrophy. Different authors use different parameters to assess the anatomical form of the palate, and therefore direct comparison between reports is often difficult. As might be expected the patients quoted in the ENT reports almost always presented with predominant nasal symptoms, whereas the patients from the orthodontic literature had significantly abnormal palate forms. Opposite interpretations of the cause and effect of the syndrome are prevalent. To what extent, therefore, does adenoid hypertrophy, a long face, or maxillary alveolar shape contribute to the production of adenoid facies in those individuals who do not have gross nasal or palatal pathologies?

We decided to take two groups of patients with contrasting facial forms who attended an orthodontic department for problems of malocclusion, and to question these patients about the presence of nasal symptoms. The patients in the initial survey were not selected on the basis of palatal form

*From the University of Minnesota Department of Otolaryngology and Department of Oral Pathology.

†Present address: Universität's Krankenhaus Eppendorf, Nordwestdeutsche Kieferknuik, 2000 Hamburg, West Germany.

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Send Reprint Requests to Cedric A. Quick, M.D., Case Western Reserve Univ., Professor and Chairman of Otolaryngology, 2065 Adelbert Rd., Cleveland, Ohio 44106.

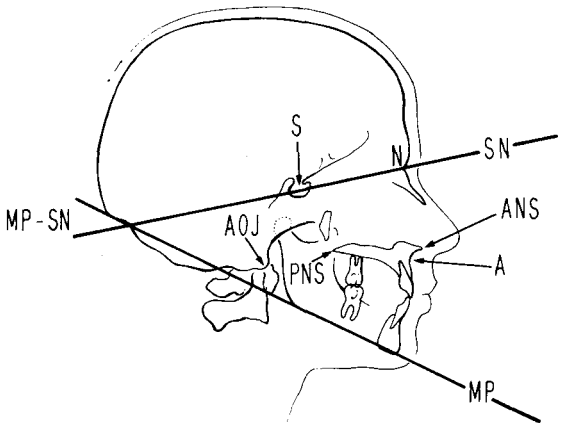

Fig. 1. Lateral cephalometric tracing of radiograph showing the determination of the mandibular plane-sella nasion angle (MP-SN); A, subspinale; ANS, anterior nasal spine; AOJ, atlanto-occipital joint; N, nasion; PNS, posterior nasal spine; S, sella surcica; SN, sella nasion line; MP, line of mandibular plane.

or position, but according to the general shape of the face, either broad face or long face. Subsequently, an evaluation of the palatal form and position in the skull was undertaken to see if there was a statistically significant relationship between the facial growth pattern, the shape of the palatal vault, and symptoms of nasal airway obstruction.

MATERIALS AND METHODS.

The 155 patients were selected from the current files of the Division of Orthodontics, School of Dentistry, University of Minnesota, and ranged in ages from 7 to 29 years, with slightly more females than males. Two groups of patients were selected, one with a low mandibular plane-sella nasion angle (MP-SN) and the other with a high MP-SN angle. The MP-SN angle is the angle between the mandibular plane (MP) and the base of the skull (Fig. 1). The mandibular plane is defined as the line along the lower border of the horizontal ramus of the mandible and the base of the skull is represented by a line between the nasion and the midpoint sella turcica. The accepted mean of this angle is 32°.[9] A low MP-SN angle was designated as an angle of 26° or less and a high MP-SN angle was one of 38° or more. Those patients with a low MP-SN angle may be termed the broad-face group and those patients with a high MP-SN angle the long-face group.

A questionnaire was designed to try to assess the symptoms of nasal obstruction, rhinorrhea, pharyngitis, allergic rhinitis, previous surgery of the upper airway, and surgery of the paranasal sinuses (Table I). Completed questionnaires were returned by 51 patients of the broad-face category and 62 patients of the long-face category. Based upon the responses of the questionnaire, a working or provisional diagnosis of each patient was made by an otolaryngologist who had no knowledge of to which group the patient belonged. The frequency of the symptoms and the numbers of provisional diagnoses were tabulated (Table II). The initial lateral cephalometric radiographs of these patients (before orthodontic treatment) were then examined. Four measurements were made on each of the cephalograms. These were the palatal length, the sagittal and oblique diameters

TABLE I.

Questionnaire on E.N.T. Symptoms.

1.1. Do you suffer from frequent colds?	YES	NO
1.2. If yes: How often approximately do you have a cold? 3-5 5-10 10 and more a year (Please circle one).		
2.1. Do you have difficulty in breathing through your nose?	YES	NO
2.2. If yes: Is this present all the time?	YES	NO
2.3. Is this only during a cold?	YES	NO
2.4. Is it worse in *Autumn, Winter, Spring, Summer*? (Please circle one.)		
2.5. Is one side of your nose always more obstructed than the other side?	YES	NO
3. Do you often have attacks of sneezing?	YES	NO
4. Do you snore at night?	YES	NO
5.1. In the morning do you experience dryness or a burning sensation in your throat?	YES	NO
5.2. Hoarseness of your voice?	YES	NO
6.1. Do you have any nasal discharge or drainage?	YES	NO
6.2. If yes: Do you think it is more likely from the FRONT or the BACK of your nose? (Please circle one.)		
6.3. Is it more YELLOWISH or more WATERY (Circle one).		
7.1. Do you suffer from pain in your cheek or have a swelling of your face?	YES	NO
7.2. If yes: Is it more in the MORNING or in the EVENING? (Circle one.)		
7.3. Is it worse in bending forward?	YES	NO
8.1. Have you ever had any one of the following operations:		
Tonsillectomy	YES	NO
Adenoidectomy	YES	NO
Nasal polyp removal	YES	NO
Nasal septum straightening	YES	NO
8.2. Did this operation give you relief of the above mentioned symptoms?	YES	NO
8.3. Did some of these symptoms persist or stay almost unaltered after the operation had been performed?	YES	NO
9. Have you any known allergies or hay fever? If yes, please explain.	YES	NO
10. Have you ever had any sinus operation? If yes, please explain.	YES	NO

Note: Questionnaire given to patients inquiring about possible symptoms referrable to the nose and throat.

of the nasopharynx and the MP-SN angle. The length of the hard palate was measured between the anterior nasal spine (ANS) and the posterior nasal spine (PNS). The sagittal diameter of the nasopharynx was measured between the posterior nasal spine and the midpoint of the anterior margin of the atlanto-occipital joint (AOJ) and corresponds approximately to the exit of the nasopharynx into the oral pharynx. The oblique diameter of the nasopharynx was defined as the distance between the posterior nasal spine and the midpoint of the pituitary fossa in the midfacial plane, which roughly corresponds to the entrance into the nasopharynx from the nose (Fig. 1).

RESULTS.

The results of the analysis of the symptom complexes that led to the working diagnosis of allergic rhinitis, deviated nasal septum, maxillary sinusitis, adenoid hypertrophy, and nasal impairment due to undetermined

TABLE II.

Working Diagnosis Based on Questionnaire Responses.

Symptoms	Diagnosis	Broad-Faced	Long-Faced
Frequent attacks of sneezing and watery discharge	Allergic rhinitis	20	17
Obstruction consistently to the same side of the nose	Deviated nasal septum	14	20
Mucopurulent nasal drainage, frequent pain in the cheeks, especially on bending forward	Maxillary sinusitis	9	9
Snoring "at night" in children younger than 14 years of age	Adenoid hypertrophy	5	21
Snoring in children older than 14 years of age; (continued snoring after adenoidectomy; dryness of throat with hoarseness of the voice, especially in the mornings, etc.)	Nasopharyngeal impairment, undetermined causes over 14 years of age	4	12
Nasopharyngeal obstruction other than adenoids in children under 14 years of age; (continuing snoring after adenoidectomy, etc.)	Nasopharyngeal impairment undetermined causes under 14 years of age	12	39

Note: Analysis of responses to patient questionnaire showing summarized symptoms, working diagnosis and distribution into the broad and long face categories.

causes, in the long-faced and broad-faced groups are summarized in Table II. There was little difference in the incidence of allergic rhinitis, maxillary sinusitis, or deviated nasal septum between the two groups. In the patients confirming symptoms of adenoid hypertrophy or previous adenoidectomy or symptoms of nasal obstruction due to undetermined causes there was a significant difference between the two groups. *e.g.*, of nasopharyngeal impairment in children over 14 years of age, positive symptoms were noted in 39 patients (63%) in the long-faced group, and in 12 patients (23%) with positive symptoms in the broad-faced group. This represents a statistically significant difference with a p value less than 0.05.

Most of the patients of our series underwent the initial orthodontic evaluation and cephalometric radiography at 13 years of age. However, at the time they received the questionnaire the average age of the long-faced group was 13.5 years and the broad-face group was 16.4 years.

The average length of the palate measured by cephalometric evaluation was 52.9 mm. in the broad-face group and 52.1 mm. in the long-faced category. This difference is considered statistically significant with p being less than 0.05.

Discussion and Results.

In the 19th century, anthropologists divided the overall morphology of the human face into three groups: the normal face, the long face or dolichoprosopy and the broad face or brachyprosopy (Bumuller).[10] Orthodontists in the past two decades have tried to analyze the various patterns of facial growth. Based on Bjork's preliminary work,[11,12] Isaac and his associates described two extreme patterns of facial growth.[13] These were called the "backward rotating mandible" or the high MP-SN angle and the "forward rotating mandible" or the low MP-SN angle. Biewald demon-

strated that these are probably the same entities as those described earlier by the anthropologists: Dolichoprosopy is the same as the high MP-SN angle and brachyprosopy is the same as the low MP-SN angle.

The characteristic appearance of the pinched nose, open mouth and boggy nasal mucosa, termed adenoid facies, is frequently seen in the patients with high arched palates. When these individuals present to the otolaryngologists for symptoms suggestive of adenoid hypertrophy, they implant the impression that the high arched palate is directly associated with poor nasal function. As early as 1897, Siebenmann[34] and his pupil, Grosheintz[15] stated that compared to broad-faced individuals, long-faced individuals more frequently presented with adenoid hypertrophy, a small nose, and a high palatal vault. Gerlach (1953)[16] pointed out a high frequency of adenoid hypertrophy in dolichoprosopy. Talbot (1891)[1] felt that hereditary factors or sickness and fever led to arrested development of the maxillary bones and the subsequently contracted jaw would then result in mouth breathing. Linder-Aronsen[17] (1970) proposed that a person with a long face had a smaller nasopharynx and therefore was more susceptible to increased adenoid hypertrophy. This, he predicted, would lead to poor nasal function, mouth breathing and result in a contracted maxillary dental arch.

In our investigations there was undeniable evidence that dolochoprosopic patients had more nasal problems than brachyprosopic patients. These nasal problems excluded allergic rhinitis, nasal septal deviation and maxillary sinusitis. The decision of what to call positive nasal symptoms was made from our questionnaire without prior knowledge of the underlying orthodontic conditions. The possible limitations and ambiguities of our quentionnaire are conceded. Since our patients were geographically widely distributed, it was not possible to personally interview them. In addition, it was felt inadvisable to place these patients into a setting that might unwittingly suggest to the patient that he should have the symptoms under question. Also, if examination of a patient by an otolaryngologist was allowed, then a biased impression might inadvertently enter into the interpretation of the patient's symptoms. The questionnaire was therefore felt to be the most satisfactory way of performing an initial screening and it was designed to be answered easily by all individuals.

Using the cephalometric analysis, it was found that there was no difference in palatal length between the broad-faced and long-faced patients. In the long-faced patients both the oblique diameters and the sagittal diameters of the nasopharynx were found to be statistically significantly smaller compared with those of the broad group. Therefore, dolichoprosopy was seen to be associated with a smaller nasopharyngeal cavity and in these individuals there was an increase of frequency of symptoms suggestive of poor nasal airway. The triad of long face, restricted long proportions of the nasopharynx and impaired nasal airway was present. Adenoid enlargement in these individuals would not need to be of any great extent before marked symptoms would occur leading to the appearance of adenoid facies.

In another study, 18 examinations of the palatal models of these patients surprisingly showed no significant difference in the length, height, ratio of width to height or ratio of width to length between the two groups of the patients of the survey. However, there was a significantly wider palate in the brachiprosopy individuals than the dolichoprosopy group. The concept of higher palatal vault in narrow face may only be an optical illusion (Subtelny[6] 1954), as the average height of the palate was not statistically

different in the two groups under test in our series. This does not imply that an abnormally high palate does not occur in some individuals. In the analysis of our patients the difference in width of the palate was the more significant observation.

It seems that the descriptive term "adenoid facies" has some validity as an entity but that there is no evidence to support the concept that adenoid hypertrophy is the only cause of the syndrome. In individuals with a long face adenoid hypertrophy may be quite minimal but the syndrome quite marked.

No conclusion can be drawn from our series to establish a cause and effect relationship between any of the factors of adenoid hypertrophy, narrow maxillary dental arch, narrow nasopharynx or special facial growth patterns. However, if adenoid hypertrophy does occur in dolichoprosopic individuals it would obviously lead to exaggeration of the problem.

It is suggested that, in patients who present with the syndrome of dolichoprosopy and adenoid facies, corrective measures be instituted early and — more importantly — that they be directed to all aspects of the problem.

Adenoid hypertrophy can be treated by judicious adenoidectomy, However, the dolichoprosopic face frequently has a narrow palate which leads to an open bite. An open bit is known to predispose to mouth breathing and subsequently poor nasal function. Thus a vicious cycle may be established. In these individuals orthodontic measures are needed in addition to adenoidectomy and they may need to be instituted before the customary age of puberty if the problem of contracted maxilla is to be avoided. More work is needed to determine the effect of orthodontic appliances on the developing maxilla particularly in reference to the effect on the nasopharynx and its functions.

SUMMARY.

One hundred and thirteen patients with two extremes of facial growth patterns were investigated and were found to differ in the shape and position of the hard palate, size of nasopharynx, and frequency of nasal symptoms. It was demonstrated that individuals with a long face had a narrower palatal arch, a more posteriorly situated hard palate, a smaller nasopharynx, and a greater incidence of symptoms of nasopharyngeal obstruction. These findings confirm that persons with long faces have a smaller nasopharynx and are more likely to exhibit nasopharyngeal problems. Small amounts of additional adenoid tissue would then easily interfere with the nasal physiology and lead to mouth breathing. No statistically significant correlation was demonstrated between nasal airway impairment and the shape of the bony palate, however, there was a correlation between nasal airway impairment and the position of the palate. When a narrow maxillary dental arch, a narrow nasopharynx, and an impaired nasal airway exist in a special growth pattern, they almost inevitably lead to the appearance of adenoid facies. Despite their co-existence no direct cause and effect relationship has been established between these factors.

It is evident that, in any patient with adenoid facies suggesting adenoid hypertrophy, adenoidectomy alone may be insufficient to correct the problem. Correction of the palatal deformity by orthodonotic procedures will be necessary and may need to be instituted at an age earlier than for conventional orthondontic treatment. It is further hypothesized that a combi-

nation of adenoid and intranasal surgery, to improve the airway together with orthodontic treatment of the palate, would prevent certain chronic diseases of the nose, paranasal sinuses, pharynx and permanent dentition.

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