Nasorespiratory Considerations In Orthodontics

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INTRODUCTION

Interpretation of the significance of variations in the growth and function of the nasal cavities, the nasopharynx and the oropharynx is dependent upon an understanding of the normal growth of the skull. In this respect, however, knowledge of normal growth has often been gained by recognition, and observation of abnormal craniál function, and development. Thus, aberrant respiratory modes such as chronic mouth-breathing have frequently been associated with dentofacial deformities. From the outset it is recognized that not all research workers have reported significant evidence that a relationship exists between mouthbreathing and dentofacial form. Many current concepts concerning the role of respiration in the aetiology of malocclusion are based on somewhat subjective impressions and anecdotal reports that form a significant part of the literature on this subject. It is on record that mouth-breathing may be associated with all types of malocclusions as well as with normal occlusion.[1] The purpose of this article is to review the available evidence. If both data and untested popular beliefs are subjected to the same rigorous criteria, indications for the orthodontic management of patients with nasorespiratory obstruction may gain a more rational approach to treatment recommendations.

CORRELATION BETWEEN FACIAL GROWTH AND NASOREPIRATORY FUNCTION

The orthodontic relevance of nasorespiratory obstruction and its effect on facial growth continues to be debated after almost a century of controversy. The continuing interest in nasal obstruction is fueled by strong convictions, weak evidence, and the prevailing uncertainty of cause and effect relationships that exist. The essence of any debate is to provide opposing evidence from which a majority vote is obtained. Political issues may be appropriately resolved by such means as a majority vote. Scientific issues, however, can only be resolved by data and appropriately structured hypotheses put to the test.[2] One of the problems in debating nasorespiratory obstruction and facial growth is the inability to provide unequivocal answers to such issues as:

How much nasal obstruction is clinically significant? At what age is the onset critical and for how long does it have to exist before an effect on facial growth can be expected?

These questions depend on the fundamental premise of being able to define nasal obstruction. The nose has an anterior opening designated as the nares, a middle portion that is influenced by the turbinates and their associated vascular mucosa that enlarges and becomes engorged in those persons with allergic rhinitis, and the posterior nares that open into the nasopharynx and may be affected by adenoidal hypertrophy. An important issue in nasal obstruction is therefore to identify where the obstruction occurs. Various methods have been proposed and used in different studies. These include:

(1) Cross sectional area, which will be affected by turbulence;

(2) Peak nasal flow rate, which was used in studies;

(3) Nasal resistance, which may vary over time; and

(4) Respiratory mode, which identifies nasal/oral ratio of air flowing through the nose and the mouth.

If the evidence from which we make clinical decisions is the result of studies that are not comparable, then one method of treatment cannot necessarily be compared with an alternative.2

Hence to provide unequivocal answers, clinical studies need to be designed to identify and quantify the degree of nasorespiratory obstruction and compare individuals for any clinically relevant differences.

MALOCCLUSION - THE ISSUE STILL IN DEBATE

Is there a cause and effect relationship between adenoids, nasal obstruction and malocclusion?

Dentofacial changes associated with nasal airway blockage have been described by CV Tomes in 1872 as adenoid facies. Tomes coined this term based on his belief that enlarged adenoids were the principle cause of airway obstruction and resulted in noticeable dentofacial changes.[3] Tomes reported that children, who were mouth breathers, often exhibited

narrow V-shaped dental arches (fig 1).[4]

This narrow jaw is a result of mouth breathers keeping their lips apart and their tongue position low. The imbalance between the tongue pressure,

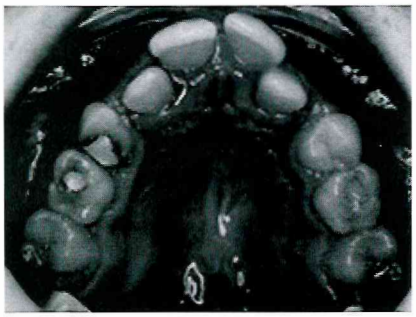

FIG 1

and the muscles in the cheek, result in cheek muscles compressing the alveolar process in the premolar region. Simultaneously, the lower jaw postures back. These simultaneous actions have been termed the compressor theory.[5]

Tomes' views were supported in the 1930's by numerous leading orthodontists. These supporting clinicians reported airway obstruction as an important aetiologic agent in malocclusion. Rubin advocated that in order for these patients to fully be assessed they must be thoroughly evaluated by both a rhinologist and orthodontist.[3] Malocclusion is the departure from the normal relation of the teeth in the same dental arch or to teeth in the opposing arch.[6]

Airway obstruction, coupled with loss of lingual and palatal pressure of the tongue, produces alterations in the maxilla. The positioning of the tongue also plays an important role in mandibular development. The tongue displaced downward can lead to a retrognathic mandible; and an interposed tongue can lead to anterior occlusal anomalies.

Additionally, maxillary changes can be viewed in the transverse direction, producing a narrow face and palate often linked with cross bite; in the anteroposterior direction, producing maxillary retrusion; and in the vertical direction causing an increase in palatal inclination as related to the cranial base and excessive increases of the lower anterior face height. The most commonly found occlusal alterations are cross bite (posterior and/or anterior), open bite, increased over jet, and retroclination of the maxillary and mandibular incisors.[7] Mahony and Linder-Aronson's findings were in agreement with the significant correlation between changed mode of breathing and diminished mandibular / palatal plane angle (ML/NL) found in adenodectomized children.[8]

Several authors have taken the position that alleged faces are not consistently found to be associated with adenoids, mouth breathing, nor a particular type of malocclusion; and that there is no cause and effect relationship between adenoids, nasal obstruction/mouth breathing and malocclusion.

Proponents of this position believe that the V-shaped palate was inherited and not acquired through mouth breathing. (Hartsooh 1946) on a review of literature related to mouth breathing, concluded that mouth breathing is not a primary etiological factor in malocclusion. Additionally, Whitaker (1911) found that in a study of 800 children, who underwent adenoidectomy or tonsillectomy only 30% had dental anomalies that needed orthodontic intervention. There is some suggestion that adenoids and hypertrophic tonsils are a consequence of a thyroid hormone deficiency. This hormone deficiency acts as a catalyst for activating the organism's defense mechanisms which include hypertrophy of lymphoid tissue.9 Another orthodontic clinician, Vig, took the position that without documented total nasal obstruction, any surgery or other treatment to improve nasal respiration, is empirical and difficult to justify from an orthodontic point of view.[10]

NASAL RESPIRATORY EVALUATION

The relationship of airway obstruction and dentofacial structures/malocclusion is still the subject of investigation and controversy amongst orthodontists. The correlation between functional problems and morphologic characteristics is yet to be solidified. Regardless of varied opinion in this area practitioners should observe each patient carefully.

Suggested protocol:

As the patient enters the room, facial and head posture should be noted to see if the lips are closed during respiration.

1. Signs of allergic rhinitis should be noted, as well as histories of frequent colds or sinusitis.

2. Assessment of family history for allergies is important.

3. Sleep history should be evaluated: sleep apnoea, loud snoring, open mouth posture while asleep.

4. Patient is asked to seal their lips - difficulty breathing through nose should be noted. One nostril can be occluded and the response noted - same procedure on the other side (fig 2).

The evaluation of nasal airway patency is complicated, especially when the possibility exists that airways may clinically appear inadequate but be quite functional physiologically. Lip separating or an open-mouth habit is not an infallible indicator of

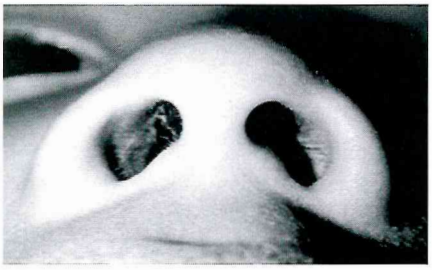

FIG 2

mouth breathing. Often complete nasal respiration is coupled with dental conditions that cause open-mouth posture.[4]

ADENOID EVALUATION

Nasopharyngeal space and the size of adenoids have been evaluated using different methods of assessment:

- Determination of the roentgenographic adenoid/nasopharyngeal ratio (a lateral cephalometric xray);
- Flexible optic endoscopes;
- Acoustic rhinometry; and
- Direct measurements during surgery.

Direct measurements are considered to be the most accurate because space can be assessed in three directions (fig 3).[11] A lateral cephalometic radiograph is an added valuable diagnostic tool for the orthodontist in the evaluation of children with upper airway obstructions (fig 4).[12]

The use of lateral cephalometric radiographs to evaluate the upper airway is somewhat limited as they provide two-dimensional pictures of the nasopharynx, which consists of complex

FIG 3

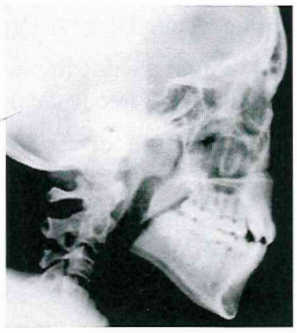

FIG 4

three-dimensional anatomical structures. Not withstanding this observation Linder-Aronson found a high level of correlation between the results of posterior rhinoscopy and radiographic cephalometrics, in the assessment of adenoid size.[2]

TREATMENT OF NASAL OBSTRUCTION

- Adenoidectomy with or without tonsillectomy is indicated if hypertrophied adenoids (and tonsils) are the cause of upper airway obstruction.[3]
- Powered-Shaver Adenoidectomy - Adenoidectomy coupled with Endoscopic Visualization will assist in achieving adequate removal of adenoids particularly high in the nasopharnx. Use of the powered-shaver technique allows for better clearance of obstructive adenoids. The end result is more reliable restoration of nasal patency.[13]
- Septal surgery (rarely indicated in the child) but may be considered in the presence of a marked nasal septal deflection with impaction. Conservative septal surgery in growing patients will not have an dverse effect in dentofacial growth.[14, 15, 16]
- Maxillary expansion (RME or SAME) - an orthodontic procedure that widens the nasal vault.3
- Cryosurgery or electrosurgery - this is a viable option for patients with vasomotor rhinitis.[3]
- Bipolar Radiofrequency Ablation (allergic rhinitis) - performed under local anesthetic
- Inferior turbinectomy - Using powered instrumentation
- Use of nasal sprays.

CONCLUSION

The effect of adenoids on facial expression, malocclusion and mode of breathing has been a topic of debate and investigation by practitioners in the field for the last one hundred years. A review of the literature exposes several theories.

A healthcare provider, with a practice philosophy based on prevention of malocclusion development, cannot ignore the early years of the patient's growth cycle. By age twelve, 90 percent of facial growth has already occurred. This is the age when many practitioners begin orthodontic treatment.[3] This is the age when 80-90 percent of craniofacial growth is complete, so most formation and/or deformation has occurred.[17] To wait until 90 percent of the abnormality has occurred, before beginning treatment, is not consistent with a preventive philosophy. Interceptive measures must be initiated sooner. Early intervention requires an acceptance of a multidisciplinary approach to total patient health. An integrated approach to patient evaluation, diagnosis and treatment is most effective. Primary care physicians, dentists, allergists, otorhinolaryngologists, and orthodontists must all work together for early prevention and management of young patients with increased nasal airway

resistance.

After diagnosis, a comprehensive risk benefit analysis regarding early intervention must be considered. Although hereditary and environmental factors must be considered, the universal goal is the promotion of proper nasal respiration throughout a child's early years of facial growth.

Despite the considerable attention given to the growth of the pharynx, the statement of Scott (1955) that, "less is known about the growth of the pharyngeal region than any other part of the face" is still largely true.

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