Airway Interference: A Clinical Perspective

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The diagnosis and treatment of airway interference is a controversial area of clinical interest. Disagreement exists among physicians, dentists and others concerning the identification of many physical findings related to breathing capabilities, and the consequences in growth and development of such findings.[1-4]

There is a critical need for the development and implementation of an examination and treatment protocol for patients with suspected airway interference problems. Such a protocol should facilitate improved communication about patient problems and treatment options, and should provide a mechanism for the collection of research data to clarify the variables associated with this condition.

Purpose

It is the purpose of this article to review briefly the current data base associated with airway interference, and to present a clinical perspective about airway interference problems that can aid the myofunctional clinician in treatment planning recommendations.

Background

Since adequacy of the airway is essential for life, respiratory demands strongly affect tongue and jaw position. The initial resting posture of the tongue, from which swallowing and speaking movements begin, is established along with the airway.[5] An anterior tongue posture can result from an airway interference in the nose or pharynx, although there are a host of other contributing factors that may account for a forward tongue position.

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A common example of a suspected airway interference condition is the patient with a mouth open, lips-apart posture. This clinical observation is often inappropriately labelled "mouthbreathing". It should be stressed that "mouthbreathing" is not synonymous with a mouth open, lips-apart posture (commonly referred to in dentistry as "lip incompetence").[6,7,8] In our opinion, "mouthbreathing"should never be used as a clinical label unless an objective physiological assessment of the airway has been made.

Some orthodontists feel that an airway interference can affect facial growth and tooth position.[3,9,10] Further, such advocates contend that facial growth patterns can be modified or reversed by surgically opening the upper respiratory areas. Such surgeries might involve nasal turbinate reduction, septoplasty, or adenotonsillectomy.[9,10,11] On the other hand, many (probably most) clinicians and investigators feel that, at present, there is no clearly definable relationship between breathing pattern and tooth position or facial growth pattern.

The patient who possesses a severe malposition of the facial skeleton or dentition may often, but not always, show evidence of partial obstruction in the upper respiratory area. Even the patient with a "long face syndrome" does not always demonstrate breathing difficulties.. While any reasonable pattern may account in part for tongue or jaw posture in a given patient, it is the patient with marginal skeletal and dental malformations that acounts for the greatest controversy. What criteria can be employed objectively to determine that facial growth or dental alignment will be enhanced or reversed if the airway is surgically cleared?

Radiographic Assessment of the Airway

Cephalometric x-ray studies of the head and neck are of considerable value in describing the morphology of a given patient. However, at present, there is not a strong correlation between the radiographic appearance of various anatomical areas of the upper respiratory apparatus and the patient's ability to function adequately. For example, there is a weak correlation between the degree of perceived nasal constriction seen in the frontal

(P-A or A-P) radiograph and objective aerodynamic measurements of airflow and nasal resistance through the nasal chambers.[7,12] That is, what one sees of the contents of the nasal cavities on a two-dimensional frontal radiograph is not predictive of the three dimensions of the nasal cavity nor of the ability of that patient to drive air through an apparently constricted nasal chamber.

In the lateral cephalometric projection, the soft tissue outline of the posterior wall of the pharynx can be misleading. The amount of adenoid shown represents the amount of tissue at the midline of the pharynx only. Many individuals with an apparently enlarged adenoid pad are able to breathe normally through the nose.[8]

Radiographic studies of the airway suffer from a two-dimensional, incomplete view of the structures under consideration. In spite of the limitations of radiographic assessment, such data is useful as part of the total data base in describing the characteristics of the patient.

Airway Surgery

Where surgical modification of the airway has been carried out as a means of improving breathing capability, long term followup results have not proven conclusively that breathing pattern has been permanently changed. It is felt by many clinicians that surgical recommendations for modification of the airway, as currently practiced, are directed at treating the *symptoms* rather than the *cause* of the problem. A case in point is the patient with allergic rhinitis. Such a patient with hypertrophied nasal mucous membranes may experience transient relief from nasal airway interference with a turbinate reduction. Subsequent to surgery, however, the mucous membranes further hypertrophy and reestablish the previous nasal conductance problem if the rhinitis is not addressed. Thus, for these patients, the physiologic problem in breathing is related to a medical condition rather than an anatomically-based condition. In fact, a deviated nasal septum or an enlarged nasal turbinate may serve to mask the underlying rhinitis condition by encouraging the clinician to focus on the anatomical variation seen in examination.

Aerodynamic Studies

An aerodynamic assessment of the breathing apparatus during quiet respiration is an objective method of quantifying the patient's respiratory effort.[13,1,15] Such testing, as done in our center and in other locations, has revealed several interesting insights about form and function.

We have been impressed that, on a general basis, children exhibit poor *nasal* hygiene. The typical child patient that is assessed aerodynamically (as described by Riski in a companion article) demonstrtates nasal conductance changes up to 50% following the clearing of the nasal cavity of debris. The patient does this, of course, by blowing his/her nose. In addition, we find that use of a nasal decongestant spray to shrink the mucous membrane lining of the nose often opens the airway to a considerable extent. Patients that show spontaneous improvement in nasal respiration following procedures to clear the nose or increase its patency are considered good candidates for medical treatment of the condition.

Airway testing sometimes involves the use of a face mask. In other instances, a soft catheter is placed into the nostril area to dilate the nostril and liminal valve for testing. The *liminal valve* is a normal constriction in the nasal cavity about 1 centimeter beyond the nostril rim. It is the product of the normal depression of the surrounding alar cartilage. When the liminal valve is very small, a nasal conductance problem can occur. Surgery to increase the size of the liminal valve is reported to be a simple procedure, and one which can dramatically improve the ability to engage in a nasal mode of respiration. The simple procedure of dilating the nostril and liminal valve during testing is an effective method of identifying patients whose airway interference is at this location.

It is unfortunate that many patients whose major anatomical problem is an overly constricted liminal valve have been subjected to unsuccessful septal straightening; turbinate reduction, removal, crush, or diathermy; or have undergone a tonsillectomy or adenoidectomy. Airway testing with calibrated aerodynamic equipment provides a conservative and accurate method of assessing the possible relationships between anatomical variation and breathing capabilities. Caution is advised in recommending surgical treatment of airway complaints based solely on anatomical examination.

An increasing number of medical centers possess the necessary instrumentation for airway assessments. The equipment is available commercially.

Nasendoscopy

Most medical centers now possess a nasendoscopy instrument that provides an excellent view of the nasal cavity and pharynx. Most nasendoscopes include a small, flexible fiberoptic probe and lens and a viewing/light source unit. Polyps, bony spurs and other soft and hard tissue variations are well visualized by nasendoscopy. We find this tool to be an excellent complement to airflow testing when specific anatomical information is needed for identifying airway interference characteristics.

Need for an Examination Protocol for Airway Problems

There is a need for the development of standards for the various components of an airway examination that will facilitate objective clinical decisions. To accomplish this goal, several aspects of the problem need to be specified; 1) an understanding of the nature of the airway interference in a given patient; 2) the location of the source(s) of interference; 3) the objective evaluation of the physiological event and the anatomical parts involved; and 4) the selection of effective treatment options.

In our view, airway interference is a *medical* problem that may or may not have a clearly demonstrable relationship to facial form, facial growth, or an orthodontic treatment regime. There is a need for a multidisciplinary protocol for examining and treatment planning appropriate patients.

Suggested Protocol for Suspected Airway Interference

A patient who is believed to have an airway interference problem should be examined for respiratory function using some aerodynamic apparatus currently available (such as described by Riski in a companion article). Airway assessments should be accomplished on at least *two*, and preferrably *three* or more occasions to reduce the effects of any transitory breathing characteristics. It is known, for example, that the nasal respiratory cycle changes every 30-90 minutes; that is, any individual should be able to breathe more freely out of one nasal chamber or the

other on a cyclic basis.

An aerodynamic assessment of breathing capability should be done with the patient performing under natural as well as the best possible circumstances. This involves testing before and after clearing the nasal cavity of debris, and by the use of antihistamine sprays or some other decongestant to shrink the mucous membranes of the nose.

A physical examination of the head and neck area of the patient should be done by a physician. This recommendation is based on a philosophy that airway interference is a medical problem having many possible causes and several possible sites in the respiratory apparatus. Besides the nasal speculum, the best tool of examination for anatomical assessment of the breathing mechanism is the nasendoscope. Signs of allergic rhinitis are also amenable to description using the nasendoscope.

Anatomical examination of the airway can also be supplemented by radiographic examination. X-ray film analysis can supply additional insights about aerodynamic and nasendoscopic findings, rather than serving as the nucleus of the evaluation.

Following the multidisciplinary assessment of the patient using the format described above, a consensus can be reached about the possible airway interference by the professional personnel involved. The sequence that we recommend in treating airway interference is to attempt first some conservative, non-surgical avenues such as allergy maintenance or the use of decongestants. This is consistent with the philosophy that the cause of the problem is often, simply, swollen mucous membranes. Even in the presence of a deviated septum or other anatomical variations, it is our belief and experience that many patients find relief by conservative medical treatment rather than surgical modification of the septum, turbinates, adenoids, or liminal valve. In fact, most adults show a variation in one of these areas and breathe normally in a nasal mode of respiration in spite of these deviations.

In some patients, an appropriate surgical treatment plan may be generated. For these patients, a team recommendation should help to assure that all reasonable alternative steps have been taken to treat the problem without surgery.

In the opinion of the authors, the team approach to the examination and treatment of suspected airway interference is a logical use of professional resources appropriate for a given patient. The myofunctional clinician is an excellent professional to initiate a team approach to patients with suspected airway problems. To us, the use of the above protocol is a positive step in continued attempts to provide quality care for those patients requiring airway management.

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