

# Managing airway development

A **healthy airway is the foundation for normal facial and dental development**. Addressing the underlying causes, not just addressing the teeth, is important to a child's smile and for the development of a normal airway and facial structure. Because of this connection, preventive treatment **as early as possible** is the key.

At **AJ Orthodontics**, our treatment philosophy is to diagnose and treat the underlying cause of an orthodontic problem, not just to address the symptoms.

## AIRWAY INTRO

The airway, head and facial structures, and how we breathe all function together during growth and development. As the body grows and develops, an equilibrium is established between how the body functions and the final shape the body takes. Whenever there is a problem with normal functioning, the body form and shape will be affected as a new and unfavorable equilibrium is established.

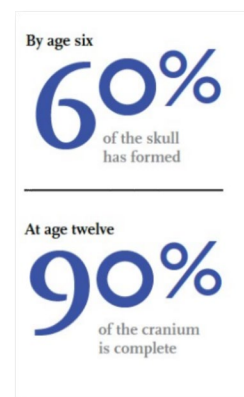
Whenever a problem is diagnosed, it is important to normalize function as early as possible to help avoid any distortions that may occur during growth and development.

## CRANIOFACIAL GROWTH

Craniofacial growth is 90 percent complete by age 12, so most formation and/or deformation of structures occur by that age.

Growth of the upper and lower jaws are nearly 50 percent complete at birth and about 90 percent complete by age 12. After age 12, only a fraction of craniofacial growth remains. Starting treatment earlier can better impact craniofacial growth and development than treatment performed later in the child's growth period.

Unfortunately, age 12 is still the average age that orthodontic and orthopedic treatment starts for most children worldwide, thus allowing for a compromised final result.

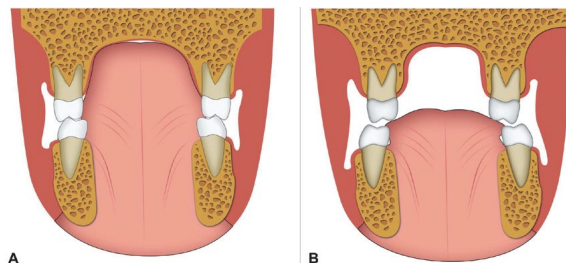


## NORMAL GROWTH

The upper jaw grows properly when breathing takes place through the nose with the tongue resting on the roof of the mouth. (Figure 1)

The tongue when properly positioned helps to mold and shape the upper jaw as it grows, allowing for proper upper jaw growth and providing adequate spacing for the teeth.

When breathing through the mouth instead of the nose, the tongue drops down and no longer rests against the palate. (Figure 1B) Consequently, the palate narrows in width with less space available for the teeth. (Figure 2) The teeth may become crowded and/or protrusive.



**Figure 1.** (A): Normal tongue position. (B): Lowered tongue position during mouth breathing.

Early dental diagnosis and treatment of airway dysfunction and head and facial abnormalities is essential. Current literature shows that early orthodontic and orthopedic treatment can positively affect the airway and breathing, which leads to proper head and facial development.



**Figure 2.** A narrow upper jaw can cause crowding of the front teeth as well as protrusion of the front teeth. When the palate is widened orthodontically, space is gained for crowded teeth as well as allowing for a more normal positioning of the protruded front teeth. In addition, the roof of the mouth is also the floor of the nose. Anything that leads to a narrow palate also directly affects the size and shape of the nasal cavity. A narrow palate leads to constricted and narrow nasal airway. The compromised nasal airway affects the ability to breathe normally through the nose and is often seen in adult apnea patients. The reduced ability to breathe through the nose leads to changes in neck and facial muscular activity, leading to improper development of dental and facial characteristics.

## NORMAL AIRWAYS AND NORMAL BREATHING

Children should not breathe through their mouth while awake or while sleeping. Normal, well-developed airways allow for a person to easily breathe through the nose, with the mouth closed.

Breathing through the nose has an important effect on normal facial structure and facial growth. Normal breathing requires adequate airway space through the nasal sinus and nasopharyngeal areas (near the throat and behind the nose). If the structures within this passage, such as the adenoids, tonsils, or nasal turbinates are enlarged, nasal breathing is affected. The result can lead to mouth breathing. Mouth breathing and nasal obstruction are common findings among orthodontic patients.

## MOUTH BREATHING AND NASAL OBSTRUCTION (stuffy nose)

Nasal obstructions can be due to physiologic factors like allergic rhinitis and polyps, or anatomical factors such as a deviated septum and a narrow nasal area. Enlarged adenoids and tonsils are the most common causes of obstruction in the nasopharyngeal area, especially at ages 5–6 years.

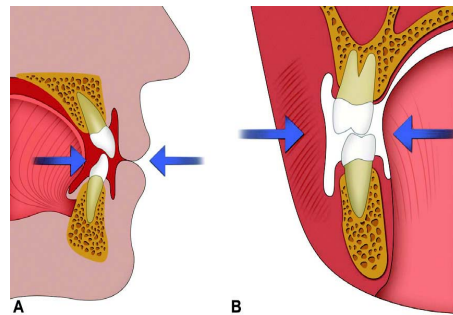
Studies have shown that upper airway obstruction/mouth breathing can cause sleep disorders and sleep apnea. Children with sleep disorders may have difficulty paying attention in school, are often tired, and may exhibit behavior problems. Many of these children often are misdiagnosed with attention deficit hyperactivity disorder (ADHD). The current standard of care for children, adolescents, and adults with ADHD are stimulant medications such as Adderall or Ritalin.

**The most common cause of mouth breathing in children is enlarged tonsils and adenoids.** The enlargement of these tissues may negatively affect airflow. Abnormal growth of these tissues may lead to upper airway obstruction causing mouth breathing. Any reason that causes nasal resistance to increase for long periods of time, such as allergies (which cause swelling of the mucous membranes that line the nose) or nasal septal deformity, has the potential to cause chronic mouth breathing.

In some children, mouth breathing is considered a habit. This habit is believed to be continued mouth breathing following the discontinuation of thumb/finger sucking and pacifier habits in children. **Long-term mouth breathing seems to affect the bite and facial structures during periods of rapid growth.** Not every patient has the same growth changes due to mouth breathing. The inherited characteristics of anatomical structures also seem to play a role in determining which patients will be most affected.

## EFFECTS OF CHRONIC MOUTH BREATHING

Chronic mouth breathing—from impaired nasal breathing—can cause progressively worse abnormal head and facial development and malocclusion in a growing child. Chronic mouth breathing interferes with proper upper and lower jaw development by disrupting tongue, cheek, and lip muscle forces. Multiple abnormal growth patterns may develop in the face, jaws and teeth.



**Figure 3.** Muscle function affects the development of the jaws and tooth positioning.

Chronic mouth breathing and nasal stuffiness leads to abnormal growth of certain skeletal structures and the whole facial complex. Chronic mouth breathing has been shown to be four times more common in children with orthodontic abnormalities.

## EFFECTS ON OCCLUSION AND DENTOSKELETAL STRUCTURES

Mouth breathing can permanently change the development of the jaws and teeth. When a tooth erupts in the mouth, it is subject to chewing forces as well as forces from soft tissues such as lips, cheeks, and tongue. This creates an **equilibrium of forces** acting on the teeth. When this equilibrium is disturbed, changes in tooth position and growth patterns can occur.

According to research, every malocclusion is associated with at least some degree of orofacial dysfunction. These issues, when identified, should be removed in order to maximize the chances of obtaining a **stable treatment outcome**.

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## CONSEQUENCES OF MOUTH BREATHING

Mouth breathing has the potential to adversely affect the growth and development of the individual, depending on the frequency, severity, and duration.

One consequence of nasal obstruction is the adaptation of the patient to mouth breathing. To facilitate mouth breathing, children usually hold their head more upright to increase airway volume; their lower jaw is dropped down and the mouth is open; the tongue protrudes in the floor of the mouth and does not touch the palate, and certain muscles (suprahyoid) are stretched.

Holding the head upright and back produces a reflex forward head posture, putting a large load on the neck and upper back muscles, which, if sustained, can cause permanent postural changes. These changes may be seen as abnormal curvature in the cervical and thoracic vertebrae and an altered shoulder posture.

Favorable changes in dentofacial structures and head posture are seen when treatment is performed at an earlier age. Some children may need further orthodontic treatment if they have already developed malocclusions.

## EARLY DIAGNOSIS

Dentists are in a unique position to screen children for the recognizable signs and symptoms of mouth breathing, malocclusion, head and facial anomalies and other related conditions such as obstructive sleep apnea syndrome. Early diagnosis of airway obstruction is essential to prevent orofacial growth abnormalities. Early diagnosis can lead to earlier orthopedic treatment, which can be more effective, simpler, and less restrictive than care at later ages.

Diagnosis of dental malocclusions and skeletal deformities associated with mouth breathing requires comprehensive and frequent orthodontic examinations.

The diagnosis and treatment of mouth breathing (and the associated medical, social, and behavioral problems) is best managed by using a multidisciplinary approach involving pediatricians, physicians, orthodontists, and ear-nose-throat (ENT) specialists.

If diagnosed early, orthodontic and dentofacial orthopedic treatment of the individual is possible. However, in adult patients, orthognathic (jaw) surgical treatment in addition to orthodontic treatment may be necessary.

If mouth breathing is treated early, its negative effect on facial and dental development and the medical and social problems associated with it can be reduced or averted.

## EARLY TREATMENT

Early treatment to reduce airway obstruction, mouth breathing, head and facial deformity, and malocclusion is essential to normalizing growth and development. Early treatment maximizes the success of corrective orthodontics and orthopedics. Dentists and ENT physicians provide unique treatments that can reduce airway obstruction and head and facial deformity.

Orthodontic appliances have been shown to increase the size of the upper airway in children. Orthodontic widening of the upper jaw has been shown to be a simple, conservative method of treating impaired nasal breathing. The younger the patient, the better long-term result can be achieved with treatment.

ENT physicians play a key role in early airway treatment. It has been shown that within a year following surgery (tonsillectomy and adenoidectomy) to improve breathing, mouth breathers with dental malocclusion have improved dental occlusion.

According to the literature, a combined treatment of adenotonsillectomy and palatal expansion significantly improved sleep and nasal breathing while alleviating the symptoms of ADHD.

## REMOVAL OF TONSILS AND ADENOIDS

With surgical removal of swollen tonsils and adenoids, many of these children who were misdiagnosed with ADHD have shown marked improvement in behavior, attentiveness, energy level, academic performance, and growth and development; in addition, nighttime bed wetting was also corrected.

Although surgical removal of swollen tonsils and adenoids should be the first line of treatment for individuals with upper airway obstruction, patients who also exhibit narrow palates and high palatal vaults require additional dental treatment. These conditions result in **narrow and compressed sinuses**, which can inhibit nasal breathing.

## RPE

**Rapid maxillary expansion** is an orthopedic procedure that produces sutural expansion in the upper jaw, and it is widely used in orthodontics to widen the palate without the movement of teeth. RME appliances have a screw in the middle of the appliance and is applied on the upper arch. Separation of the midpalatal suture is accomplished by turning the screw once a day for approximately one month. A retention period of 3–6 months is recommended after active expansion is ended to stabilize the correction.

In cases of maxillary constriction, when the palate is expanded by RME treatment, an **increase in the size of the nasal airway** occurs as well.

Orthopedic expansion of the palate by RME appliances plays an important role to **improve the nasal airflow**. A decrease in nasal resistance and a change in breathing pattern from oral to nasal have been reported after RME treatment. A decrease in upper airway obstruction was also reported in patients with obstructive sleep apnea syndrome following RME treatment.