

Dentofacial orthopaedics and maxillary morphogenesis: A case series

Theodore R. Belfor and Charles L Blum

Introduction: Three adult case reports (79 and 60 years old females and a 60 year old male) were selected to demonstrate maxillary morphogenesis. These patients were treated for maxillary underdevelopment which can affect occlusion and airway space due to the relationship between the tongue and the hard palate.

Intervention: Each patient wore the Homeoblock™ appliance for a minimum of twelve months. The Homeoblock™ consists of 'Adams clasps' on the bicuspid with a baseplate that incorporates a palatal expansion jack screw. The appliance is relieved from the palatal tissues. Flap springs rest on the anterior teeth and a Hawley arch wire extends from left to right canine. A bite block is placed on the second bicuspid and first molar on the less developed side.

Results: Improved tongue position, tone, and the resulting increased pharyngeal airway size were found with each patient.

Discussion: Once nurture seemed clearly distinct from nature. External influences seem to be able to influence a network of chemical switches within our cells collectively known as the epigenome.

Conclusion: These three cases demonstrated how modifications of tissues in the craniofacial region can occur with adult patients in their 6th and 7th decade of life.

Indexing terms: Chiropractic; chiropractor; tongue; hard palate; dentofacial; maxillary morphogenesis; Homeoblock™.

Introduction

Studies have found that modification of the craniofacial region may be possible. A significant amount of growth potential may reside in the craniofacial system throughout life. (1, 2)

Dentofacial orthopaedic therapies amount to growth guidance. Rapid maxillary palatal expansion in children is a common event, producing changes in maxillary size and shape which has been shown to affect the airway. (3) Less common is slow palatal expansion used with adults.

The focus of this paper is to explore slow palatal expansion in adults combined with changes in swallowing pattern and occlusion provided by the Homeoblock™ removable orthopaedic/orthodontic appliance. It is theorised that this appliance can provide an environmental stimulation resulting in an epigenetic response, namely maxillary morphogenesis. (4)

Morphogenesis is defined as '*the biological process that causes an organism to develop its shape*'. While changes in dentofacial orthopaedics are accepted in children, this study will

... Emerging evidence is noting a complementary effect of Chiropractic craniofacial manipulations to enhance cranio-mandibular symmetry and function ...'



discuss three adult patients treated with the Homeoblock™ and its effect on maxillary morphogenesis and airway function. (5, 6)

Cases

Three adult case studies were selected to demonstrate maxillary morphogenesis: two females (age 79 years old and age 60 years old) and one male (60 years old). These patients were treated for maxillary underdevelopment which can affect occlusion and airway space due to tongue/hard palate relationship. Orbital changes reflected by the eyes may be demonstrated and used to assess if there is maxilla underdevelopment pre- and post-treatment. Since the superior border of the maxilla is the inferior border of the orbit, it is suggested that a change in maxillary morphogenesis may affect the lower eyelid.

Treatment and Intervention

Upper and lower Homeoblock™ appliances were fabricated. Each patient wore the Homeoblock™ appliance for a minimum of twelve months. The Homeoblock™ consists of 'Adams clasps' on the bicuspids with a baseplate that incorporates a palatal expansion jack screw. The appliance is relieved from the palatal tissues. Flap springs rest on the anterior teeth and a Hawley arch wire extends from left to right canine. A bite block is placed on the second bicuspid and first molar on the less developed side. beak pliers and/or three prong pliers are used for the adjustment of clasps.

Each patient wore the Homeoblock™ appliance daily from 3:00 PM to 8:00 AM. Each patient wore the appliance initially for one week without activation. Standardised facial, intra-oral photos and a Cone Beam Computed Tomography (CBCT), iCAT scan was taken when the Homeoblock™ was inserted.

The Homeoblock™ appliance was advanced one half-turn (.012mm) after the first week and each successive week (slow palatal expansion). Each patient was seen after 3 weeks and fit and compliance were reviewed. Post treatment facial, intra-oral and CBCTs were taken after 6-12 months.

Results

The images in Figure 1 illustrate that, with these three patients, the remodelling of the maxilla in an upward and forward direction resulted in what appears to be a tightening of the lower eyelid.

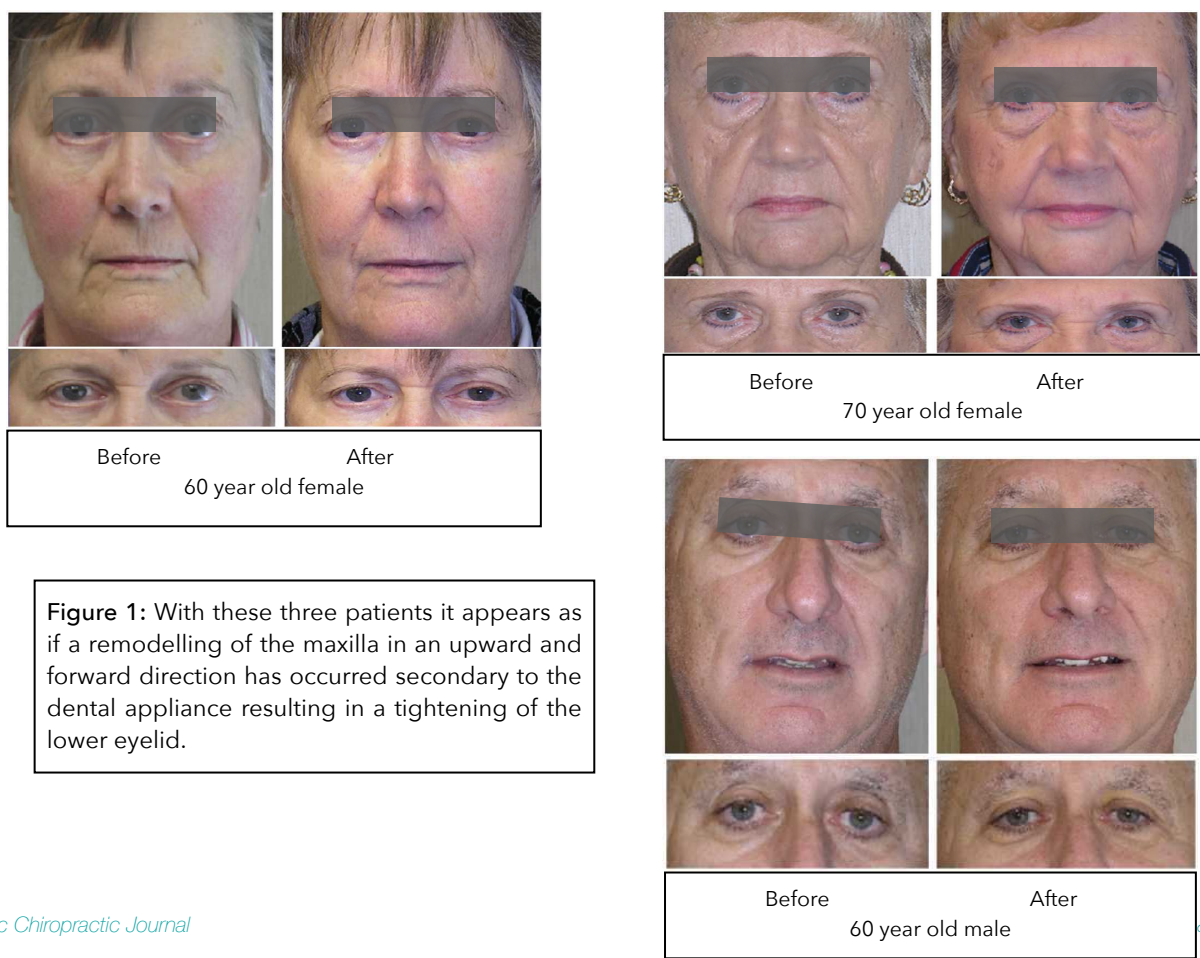
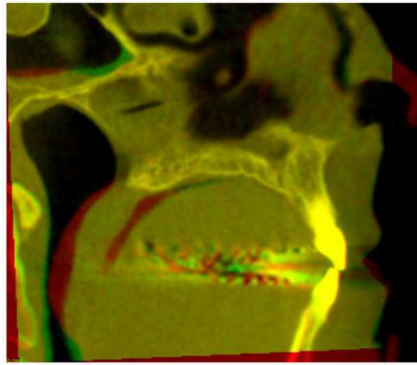


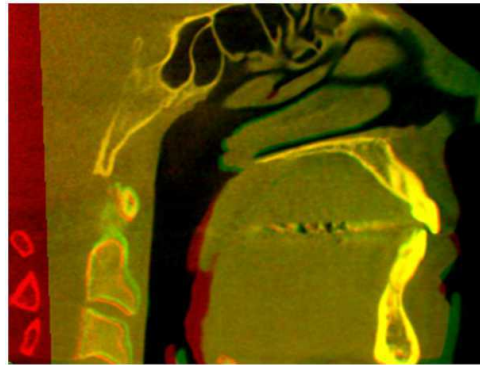
Figure 1: With these three patients it appears as if a remodelling of the maxilla in an upward and forward direction has occurred secondary to the dental appliance resulting in a tightening of the lower eyelid.

Improved tongue position, tone, and the resulting increased pharyngeal airway size was found with each patient (Figure 2).

Improvement of airway space was found in these three cases, as demonstrated by an increase in pharyngeal airway radius. Since airflow is a factor of r^4 , the radius to the fourth power, the study indicates that airway was improved considerably (Poiseuille's Law: $\Delta P = 8\mu LQ$).

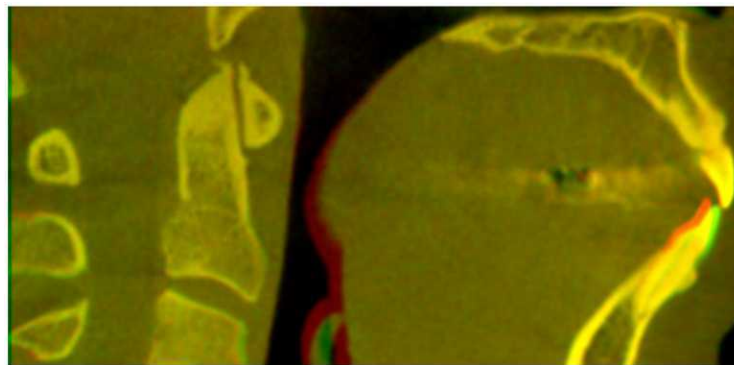


Female Age 70



Female Age 60

Figure 2: In the following case studies posterior aspect of the tongue show its improved position, tone, and the resulting increased pharyngeal airway size.

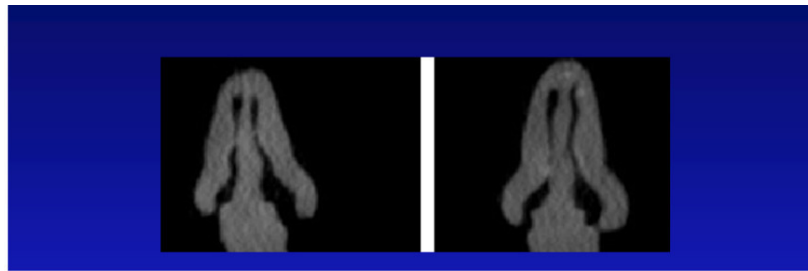


Male Age 60

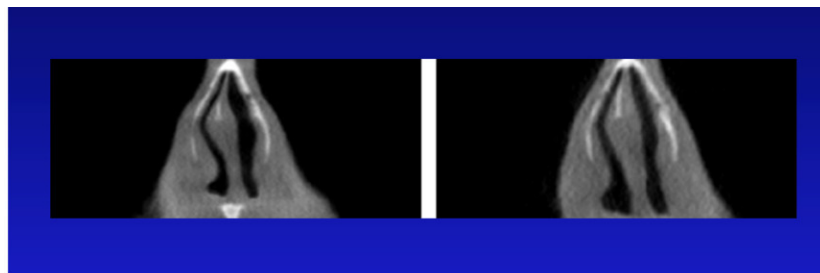
Note: These images have been created after registering before and after CBCT scan using 'Analyze 10.0' from the Mayo Clinic.

Lastly, all patients had both their nares become wider and more symmetrical, which allows for less airway resistance and improved airway function (Figure 3).

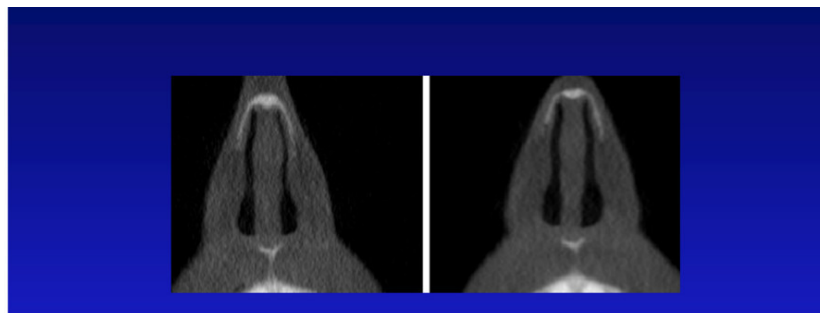
Figure 3: Epigenetic interactions can be complex and while incompletely understood, still positive changes in symmetry and width of the nares were found in these three cases.



Before After
70 year old female



Before After
60 year old female



Before After
60 year old male

Discussion

Once, 'nurture' seemed clearly distinct from 'nature'. Now it appears that our diets and lifestyles can change the expression of our genes. External influences seem to be able to influence a network of chemical switches within our cells, collectively known as the epigenome. This new understanding may lead us to potent new medical therapies such as dental orthopaedic appliances affecting maxillary and mandibular morphogenesis.

While epigenetic interactions are numerous, complex, and incompletely understood it does appear that the external body is inherently programmed for symmetry. Therefore, the changes in eye musculature and orbital shape, pharyngeal airway space, and nares symmetry could be a result of maxillary morphogenesis relating to the spatial matrix theory. (7) Singh suggests that it is *'likely that an underdeveloped midface presenting with palatal insufficiency (due to gene-environmental interactions) could be associated with malocclusions, and may simultaneously predispose to temporomandibular joint dysfunction (TMD) and upper airway compromise, such as obstructive sleep apnea (OSA)'. (7) 'Thus, in order to reestablish or enhance craniofacial homeostasis, special attention must be given to non-mandibular constraints in patients who present with a retrusive mandible, OSA or TMD. In other words, the craniomaxillary structures might need to be more thoroughly assessed before planning the final positions of the crowns of teeth'. (7)*

Therefore, maxillary and mandibular morphogenesis can also affect the airway, and morphogenesis is a physiologic phenomenon. (8, 9) Increasingly we understand that development is under epigenetic control and recent research has tied morphogenesis to epigenetic changes. (10) The epigenome is affected by altering function such as teeth contact and stomatognathic functions (e.g., swallowing). The results involve genetic expression or affecting genes that have not yet been expressed; hence, effects to the airway space and function can be quite dramatic.

While these cases have shown improved symmetry in dentition, airway, nares and facial expression, we postulate that improved symmetry relates to improved function. Likewise improved function is consistent with improved symmetry. Within the study of biology asymmetry is associated with *'poorer developmental homeostasis at the molecular, chromosomal and epigenetic levels', (11)* and both genomic and environmental changes can increase asymmetry, which represents a deterioration in developmental homeostasis apparent in adult morphology. (11) Symmetry, aside from just relating to improved function, has many social and environmental implications. (12)

Recent studies are linking craniofacial development to the problem of sleep apnea. (13, 14, 15, 16) For example, airways that are more elliptical in shape and mesiolaterally oriented had a decreased tendency toward obstruction. By improving the development, we may reduce the apnea. All biologic systems are programmed for self-correction. It has become increasingly evident in recent years that development is under epigenetic control. (14) The phenomenon of epigenetics can be a dynamic part of the future for Chiropractic, medicine and dentistry. In effect, it is the body actively healing the body.

Emerging evidence is noting a complementary effect of Chiropractic craniofacial manipulations to enhance craniomandibular symmetry and function. (17, 18, 19) Anticipated co-management of patients utilising the Homeoblock™ removable orthopaedic/orthodontic appliance with practitioners familiar with cranial and craniofacial manipulation would be expected to facilitate a patient's response to appliance care and subsequent desired epigenetic symmetrical development.

Conclusion

These three cases demonstrated how modifications of tissues in the craniofacial region could occur with adult patients in their 6th and 7th decade of life. The Homeoblock™ dental appliance utilises principles of epigenetics and the concurrent morphogenetic responses produced with dentofacial orthopaedics. The changes were represented in both soft tissue and bone and are in the direction of improved facial and airway development. Further research is needed to determine if this methodology can be generalised to the population at large and if the changes are lasting and relate consistently to improved clinical findings.

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About

Dr. Theodore R. Belfor was a graduate of [New York University College of Dentistry](#), and a Senior Certified Instructor for the [International Association for Orthodontics \(IAO\)](#), as well as a member of the *American Dental Association*, *Academy of Craniofacial Pain (AACCP)*, *American Academy of Dental Sleep Medicine (AADSM)*, *Academy of Clinical Sleep Disorders Dentistry (ACDSM)*, and *Sacro Occipital Technique Organization-USA (SOTO-USA)*.

In the 1960s, Dr. Belfor was sent to Vietnam to work as the sole brigade dentist for 4,000 soldiers of the 196th Light Infantry. From the jungles of Vietnam to Park Ave in Manhattan, upon his return, he opened his own private dental office in New York City and was in private practice for more than 40 years. He was also Dental Director for *American Healthcare, Ltd.*, in Beijing, China

Since 2001, Dr. Belfor specialised in his patient evaluation system for diagnosis and treatment with the Homeoblock™ protocol. The Homeoblock™ protocol is designed to treat facial aging and improve breathing by generating proper swallowing, tongue posture and positional changes of the bones of the cranial facial system.

The Unilateral BiteBlock Technology® which is unique to the Homeoblock™ appliance was used in the design of the FDA cleared, POD™, Preventive Oral Device, for Bruxism, TMJ and headaches. Both appliances are dedicated to maximising craniofacial function by improving wellness through face and airway development to improve breathing, TMJ function and Sutural Homeostasis.

Dr Belfor had been lecturing on his specialty worldwide, teaching and training dentists with the Homeoblock™ appliance and his unique diagnostic protocol for more than 18 years. His work was devoted to understanding the causes of sleep and breathing disorders through individual patient craniofacial analysis.

Some of his articles were published in the; *Journal of Craniomandibular Practice (CRANIO)*, *New York State Dental Journal*, *Philippine Journal of Orthodontics*, *Novoe V Stomatologii (Russia)*, *APEX (UK)*, *Journal of Cosmetic Dentistry*, *Aesthetic Dentistry Today*, *Dentistry Today*, *Journal for the American Academy of Gnathologic Orthopedics*, *Functional Orthodontist*, *International Journal for Orthodontics and Sleep Diagnosis Therapy*, *Dental Asia*.

Until his passing Dr Belfor treated patients, trained doctors and researched the efficacy of appliance therapy for healthier sleep, the airway and improved autonomic nervous system function.



Charles L. Blum, DC is in private practice Santa Monica, California and past president of SOTO - USA, now their research chair. Adjunct research faculty at *Cleveland Chiropractic College*, associate faculty at *Southern California University of Health Sciences* and *Palmer College of Chiropractic West* teaching the SOT Elective. Dr. Blum is a Certified SOT Cranial Practitioner, and on the peer review board of the *Journal of Craniomandibular and Sleep Practice (CRANIO)*, *Association of Chiropractic College Conference Peer Review Committee*, and *Journal of Chiropractic Medicine*. He has lectured nationally and internationally, has written various SOT related texts, compiled SOT and cranial related research, and has extensively published in multiple peer reviewed indexed journals and at research conferences from 1984 to the present.

