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CLINICAL EVIDENCE

Cranial therapeutic applications to facilitate dentofacial growth and development in a 50- year-old adult female: A case report

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Introduction: A 50-year-old female patient previously under chiropractic care due to multiple presenting symptoms (e.g., temporomandibular joint dysfunction, obstructive sleep apnea, mitochondrial disorders, and others) was being co-treated with sacro occipital technique cranial and TMJ techniques and a dentist practicing functional orthodontics (e.g. Alternative Lightwire Functional [ALF] and The Crane) for under-developed craniofacial growth and development.

Intervention/Methods: The patient began orthodonture/orthopedic dental care using an ALF maxillary appliance to create hard palate expansion and she started using the CRANE at night to facilitate forward advancing of her maxilla. A system of sacro occipital technique cranial related procedures focused on craniofacial expansion and tongue procedures were utilised to facilitate the reduction of her head and neck tension and improving her cranial suture flexibility to optimally affect the outcome of the orthodontic/orthopedic dental interventions.

Results: During the three years of dental/chiropractic co-treatment the patient's cervicothoracic pain and discomfort went from a chronic (over a decade) 6-8 on a visual analogue scale (10 being most painful) to a steady 1-2, and 3-4 during a flare-up, which occur during increased physical and emotional stress approximately 3-4 times a year, lasting 3-5 days.

Conclusion: Greater study is needed to determine if these conservative chiropractic treatment procedures can be helpful to paediatric and adult patients receiving maxillary expansion and advancement.

Indexing Terms: Chiropractic; Sacro-Occipital Technique (SOT); Cranial Technique; Alternative Lightwire Functional (ALF); temporomandibular; TMJ; craniofacial growth and development

Introduction

Procedures treating dental craniofacial growth and development have traditionally been associated with adolescent orthodonture and are performed mostly for aesthetic reasons. In recent years having optimal craniofacial growth and development has transitioned from aesthetics to treatment to improve an adult's airway and possibly obstructive sleep apnea (OSA). (1, 2)

> *... The Arm Fossa Test (AFT) as used in SOT is a useful clinical indicator of pelvic issues, especially during pregnancy. Here we present the results of using the test in 103 patients ...'*

There is emerging evidence to support that a restricted or 'small' mouth is often associated with restricted or reduced airflow. (3, 4, 5) Airway

compromise, or OSA, has serious ramifications leading to morbidity and mortality issues. (6, 7, 8, 9, 10)

Background

There are some very specific factors that contribute to craniofacial growth and development, and dental/chiropractic co-treatment can help to overcome the associated stressors with both children and adults. (11, 12) Some of these factors affecting the size of the hard palate and oropharyngeal space can be genetics, (13) nutritional, (14, 15) iatrogenically related to orthodontics (e.g., 4 bicuspid extraction and headgear), (16, 17, 18, 19, 20, 21, 22, 23) frenum restrictions, (24) tongue-dysfunctional actions, (25, 26, 27) thumb sucking, (28) pacifier overuse, (29) breast-feeding versus bottle-feeding in infancy, (30) mouth versus nasal breathing, (31) poor lip seal, (32) and enlarged tonsils. (33)

Radical surgery to advance the maxilla to address underdeveloped maxilla, hard palate and oropharyngeal space has some significant risks. (34, 35, 36) Therefore, conservative methods to affect craniofacial growth and development would always be preferred in the initial phases of care. (37, 38, 39, 40) There are various options for conservative palate expansion that have shown some success; (41, 42, 43) however clinically treating adults often using less force and allowing for more time for changes to occur has been found with some patients to improve outcomes with less secondary discomfort. A specific conservative protocol to assist craniofacial growth and development in adults uses the alternative light wire functional (ALF) appliance (44, 45, 46, 47) and when maxillary advancement is needed, a type of reverse headgear called the Crane (48) can also serve as an important therapeutic consideration.

Purpose of this report

The purpose of this case report is to present some cranial chiropractic manipulative interventions that can be used with palatal expansion and advancement to aid the adult patient's response to care and minimise any secondary myofascial craniofacial discomfort. Also shared will be a method of affecting the tongue as a means to maximise the optimal effects of palatal expansion and advancement, aid mandibular positioning, and improve airway function outcome.

Case History

A 50y female patient had been under chiropractic care for 20 years at this office for chronic upper thoracic and cervical spine pain and stiffness, forward head posture, temporomandibular joint (TMJ) pain, joint hypermobility syndrome, (49) and fatigue with a suspected related mitochondrial disorder. (50) Chiropractic care for her thoracic and cervical spine and TMJ pain would help temporarily, but her conditions would tend to reoccur even with following conjoint ergonomic modifications and rehabilitative exercises. Approximately after the initial three years of treatment as she transitioned into supportive chiropractic care (51) the patient was referred to a dentist who addressed her TMJ-related issues with a dental TMJ flat plane mandibular appliance, which gave her some degree of relief on and off for 10 years.

During the years she was co-treated with multiple allopathic physicians, a nutritionist, and an acupuncturist. Within the past five years (after 15 years of care) her condition appeared to worsen and, as the discomfort in her thoracic and cervical spine and TMJ increased, she noticed that her fatigue and forward head posture was worsening. She was diagnosed during this time by her allopathic physician as having a type of mitochondrial syndrome, which contributed to her chronic fatigue and related myofascial syndromes.

An assessment of the patient's stomatognathic system was made to determine if stomatognathic related airway compromise was contributing to her presenting symptomatology over the last three years. Treatment over the years had been sufficient to create stability and the patient only needed intermittent chiropractic care (e.g., 8-10 office visits a year); however as her

quality of life and activities of daily living were becoming more and more compromised, further exploration into possible aetiologies of her presentation were studied.

It was clear that she had significantly reduced craniofacial growth and development characterised by reduced hard palate transverse dimension, retruded maxilla, and incisors contacting end to end even with her mandible's condyles resting close to the mastoid processes (class two TM joint position).

She was unable to touch her tongue to the roof of her mouth due to lingual frenum restriction, and this was suspected to be related to the reduced craniofacial growth and development. Since she was in her late 40s at this time the possibility of orthodonture to affect growth and development had been not considered due to the costs and time needed to determine any possible health related benefits. Following this assessment she was referred to a functional orthodontist who proposed a conservative, non-surgical approach to improve her stomatognathic system's function with the hopes that improved airway would have positive secondary effects to her health presentation.

Intervention/Methods

Over the recent past three years the patient received chiropractic care consisting of sacro occipital technique procedures to treat chronic sacroiliac joint instability with pelvic torsion (category two), forward head posture, cervicothoracic myofascial imbalance, and cranial/TMJ imbalance. She received orthodonture/orthopedic dental care using an ALF maxillary appliance to create hard palate expansion and she started using the CRANE at night to facilitate forward advancing of her maxilla. During this time she had a lingual frenectomy, and chiropractic procedures were used to help prepare her for the surgical frenectomy intervention and afterwards to maximise the effects of the lingual frenum release.

During the ALF appliance and CRANE procedures she would sometimes plateau regarding progress (reduced expansion) or have symptoms of increased head and neck tension. A system of craniofacial and tongue procedures (covered in the discussion section) were utilised to facilitate her progress, reduce head and neck tension, and aid the goal of improving her outcome to the orthodontic/orthopedic dental interventions.

Results

The patient is still under chiropractic and dental care, which has been reduced to once every 4-6 weeks, particularly when she had a change in her maxillary expansion. Since dental/chiropractic co-treatment began approximately three years ago, the patient's cervicothoracic pain and discomfort went from a chronic 6-8 (on a visual analogue scale of 10 being most painful) to a 3-4 during a flare-up, which occurred during increased physical and emotional stress approximately 3-4 times a year. She can now easily touch her tongue to the roof of her mouth and has significantly less TMJ-related pain or discomfort.

She is able to sleep better through the night and uses the CRANE for 1-2 hours at a time, since she prefers to be a side sleeper and to use the CRANE the whole night would require her to be a supine sleeper. Still, she is awakening rested and has less fatigue during the day, which had not occurred regularly prior to the interventions described here. Her improvements have been consistent and relatively stable as she is reaching her expansion and maxillary advancement milestones.

The limitations to her maxillary expansion will be once her teeth start to move buccally or if too much space begins to occur between them. As this limit is approached, the chiropractic and cranial treatment will be to support the craniofacial positioning and improvements in head posture and cervicothoracic function.

Discussion

The cranial procedures used to assist the function of the ALF and CRANE and reduce any secondary myofascial restrictions are focused on facilitating craniofacial growth and development. The direction of pressure and emphasis is based on the craniofacial sutures, whether the sutures were beveled, interdigitated, or if they had tongue and groove-type configurations. (51, 52)

It is important assess any need for maxillary advancement and utilise this factor in all aspects of the cranial procedures in order to facilitate the actions of the ALF and CRANE. Some patients require more lateral expansion while anterior advancement is not as much an issue. Often the position of the mandible can guide this diagnostic criterion. If the mandible can be advanced sufficiently to draw the tongue forward to open the airway and the incisors can maintain a class one occlusion, then anterior advancement of the maxilla (e.g., utilising the CRANE) may not be needed. The following is a typical procedure utilised with this patient:

Step 1 Maxillary Lateral Expansion: When maxillary advancement is preferred, the procedure starts with the doctor's two index fingers inside the patient's mouth contacting the anterior aspect of both maxillae. Initial force is directed to draw the maxilla anterior-ward until a relaxation of the tissues is felt and is usually associated with a feeling of a slight "unwinding" of stress. While still maintaining this anterior-ward pressure, the next step is to attempt to create width along the intermaxillary and interpalatine sutures, which are interdigitated. This lateral expansive pressure is similarly held until the osseous tissues relax, with the initial contact starting at the anterior premaxillary area. Once the premaxillary area relaxes, the doctor moves the index fingers to the mid-maxilla and then to the palatine maintaining the anterior and lateral pressure and feeling for relaxation of the tissues.

Step 2 Expand Maxillopalatine Sutures: From the perspective of inside of the mouth looking upward, the maxilla has an overlapping bevel of bone relative to the related palatine. The goal is to attempt to facilitate advancing of the maxilla. This can be helped by using two fingers to simultaneously gently lift the palatine while drawing the ipsilateral maxilla anteriorward. This contact is held until a relaxation is felt in the tissues and then repeated on the opposite side.

Step 3 Pre-Maxilla and Maxilla Encouraged into Cranial External Rotation: Usually the doctor's index and middle finger are moved to contact intra-orally on one side the anterior (pre-maxilla) and posterior aspect of the maxilla with the thumb outside the teeth but inside the mouth contacting the superior aspect of the maxilla. The goal is to influence the maxilla, with the fingers inside the mouth, into external rotation (increasing the lateral hard palate dimension) using the thumb as a pivot point. While this external rotation is encouraged, a consistent anterior translation of the maxilla is also influenced until relaxation of the tissues occurred. Once one side is relaxed, move to Step Four and then repeat Step Three and Step Four on the contralateral side.

Step 4 Maxilla and Zygoma Simultaneously Encouraged into External Rotation: Once movement or relaxation into external rotation of the maxilla is felt, the doctor's middle finger moves from inside the teeth to outside the teeth under the mid-zygoma. The doctor's thumb moves to outside the mouth to externally contact the zygoma just lateral to the maxilla and this is used as a pivot point as\ simultaneously the maxilla and zygoma are both rotated into external rotation. This contact is gently maintained, since the intra-oral zygomatic contact is commonly very sensitive. The pressure is continued until relaxation is felt at the ipsilateral maxilla and zygoma intra-oral contacts. When both

sides are completed, if the patient's mouth will allow, both maxilla and zygoma are contacted intra-orally as before with fingers from both doctor's hands. However.this time using both hands attempt to encourage both maxilla and zygoma bilaterally to release into external rotation encouraging lateral expansion. If advancing the maxilla is a consideration, then while both the maxilla and zygoma are contacted bilaterally and encouraged into external rotation, the maxilla is also attempted to be advanced forward.

Step 5. Maxillary Rotation Encouraging Anterior Maxillary Positioning: The next step is to assess maxillary rotation with an intra-oral contact using the doctor's thumb and fingers to grasp the maxillopalatine bones above the teeth. The doctor's external contact will span to contact the patient's frontal bone and greater wings of the sphenoid. The external contact will serve to stabilise as the hard palate is rotated forward on one side with the doctor assessing adequate anterior translation. This is generally repeated until symmetry in rotation to both sides is determined. With this patient she tended to have reduced anterior hard palate rotational translation on the left side, so while maintaining the frontal/sphenoid contact her left hard palate was contacted behind the last molar and whole palate rotated forward towards the right.

Step 6. Mandible Release: With a patient that needs to have the maxilla advanced it is common that their incisors can be end to end and the mandible's condyles are retro-positioned (Class Two condyle position) releasing the mandible into a preferred anterior position is not performed initially. At the initial stages of care with a patient that cannot adequately have the mandible advanced, contact is made by the doctor's thumbs to the bilateral molars of the patient's mandible with resting of the fingers under the mandible as a figure 8 distraction type motion of the mandible is performed. The initial attempt will be to increase the vertical dimension of the temporomandibular joint. After treatment with the ALF and CRANE and the maxilla has been sufficiently advanced then the mandible can also be distracted not just to create vertical change, but also to draw it slightly anteriorward.

Step 7. Tongue Traction Release: If the patient has significant tongue and suprahyoidal muscle tension, a goal of care may be to support a lingual frenectomy and aid the progress of the ALF by having the patient be able to easily rest the tongue at the incisal papillae54. Using a sanitary paper towel, the patient's tongue is contacted by the doctor and gently tractioned forward in various positions, determining if any direction is restricted. This can be very sensitive, so the doctor will have to be gentle. When restriction is felt in one direction the tongue is held in that direction with gentle traction while the doctors other hand contacts under the chin to gently massage the related suprahyoidal muscles until relaxation occurs and the tongue moves without restriction.

This procedure has been used clinically with many patients over the past few years successfully with remarks that it gives them mouth 'space' or 'relaxes tension' from any type of maxillary expander ALF or a different palatal expander. It has been utilised to prepare the patient for dental palate expansion and to aid the process reducing secondary patient reactions to the intra-oral internal pressures.

As with all case studies caution must be used when generalising a single subject's presentation and response to treatment. This is because confounders such as placebo or ideomotor effects, regression to the mean, and other factors cannot be ruled out. However, what is compelling is that the patient had been having similar symptoms for two decades or more before starting a new treatment program that incorporated the ALF, CRANE, sacro occipital technique procedures, and specific chiropractic craniofacial therapy to aid the maxillary expansion and advancement. Her prior unresponsiveness to care and positive outcome following instituting a new treatment

protocol suggests a temporal relationship between the care rendered and the patient's symptomatology.

Conclusion

This case report discusses a 50-year-old female who was chronically suffering from upper thoracic and cervical spine pain and stiffness, forward head posture, and temporomandibular joint (TMJ) pain.

Consistent and maintained improvement began to occur when dental care with an ALF appliance to expand her hard palate and the CRANE devise to advance her maxilla along with a specific chiropractic craniofacial therapy.

Further studies should determine if this conservative procedure can be helpful to paediatric and adult patients receiving maxillary expansion and advancement.

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