

Volume 14 Issue 2

The N.A.O.L. Williams Appliance

Skip Truitt Interviews Dr. Ian Walters on the Functional Matrix

THE N.A.O.L. WILLIAMS APPLIANCE

The Williams Appliance has added a new dimension to the clinician's ability to treat the mandibular arch. With the exception of the Class III patient all orthodontic cases treat to the lower arch. Therefore if the lower arch can be correctly developed and any arch length loss regained in the mixed dentition, the orthodontic finish in the permanent dentition is more simplistic and stable. One major advantage of the Williams Appliance is that it is totally fixed which in turn allows the doctor complete control of the treatment. In addition the appliance is well tolerated by the patient, and easy to keep clean with a brush and an irrigation Device.



We will divide our evaluation of the Williams appliance into an explanation of its various components. This will allow the operator to quickly become proficient with the appliances use and adjustments.

Bands:

One of the major advantages of the Williams appliance is that it is a totally fixed orthopedic-orthodontic device. The appliance is secured by banding it to either the deciduous second molars or the permanent first molars.

In the early mixed dentition it is best to band the deciduous second molars. As the dentition matures and the soft tissue height on the permanent first molars is reduced, it is best to place the bands on the permanent first molars. Always check the radiograph if the deciduous second molars are to be banded. The deciduous tooth should have at least one half of its original root if it is to be used as an anchor unit for the Williams Appliance.

After the initial impression is made for the Williams Appliance, separating elastics are placed to create the appropriate spacing for the bands. The laboratory will use an indirect banding technique to select the correct size molar bands. If the appliance is placed on the deciduous second molar, a blank band is utilized with no buccal tube. If it is placed on the permanent first molar a band is used with a convertible buccal tube. This allows the operator to use segmented arches and utility arches in conjunction with the Williams Appliance.

Paste glass ionomer cement is used to cement the bands. The new "Ultra and-Lok" is an ideal cement for use with the Williams Appliance. If the bands are placed on the deciduous second molars, the molars should be acid etched and the inside of the bands sand blasted by the laboratory to enhance retention. This procedure is not necessary when the bands are placed on the permanent first molars.



Expansion Screw:

The expansion screw that is used in the Williams Appliance is specifically designed to allow the laboratory to fabricate the appliance without over heating the screw itself. Overheating the expansion screw when soldering the appliance can damage the threads within the gear. All intra-oral expansion screws are adjusted with a special key. The key is mounted on a large plastic handle, which makes it easy for the parent to control. The key itself has a bayonet bend at the tip to prevent the key from passing completely through the expansion screw and injuring the soft tissue. The expansion screw is adjusted by the parent twice a week. Each adjustment is .25mm. If the case has an open bite the activation is reduced to once a week to prevent the bite opening effect which occurs in conjunction with arch development.

Lingual Arch Wire:

The laboratory will fabricate the Williams Appliance with a .014 nickel titanium lingual arch wire. The wire is inserted into bilateral .030 lingual tubes, which are sealed at their distal aspect. When the appliance is placed the arch wire is automatically activated against the lingual surface of the lower anterior teeth. As the arch is developed, the lingual arch wire begins to align the incisors. The reciprocal force from aligning the incisors has a distalizing effect on the banded molars. When the lingual arch wire becomes symmetrical it has also become passive. Thus the clinician can evaluate the activation of the arch wire by evaluating its symmetrical shape. If additional force is required in the lingual arch wire to either align the incisors or regain arch length, it can be reactivated. To reactivate the arch wire it is removed with the Weingardt plier. The old .014 arch wire is used as a guide and a new .016 arch wire is fabricated 2mm longer on each side. The new wire is then inserted into the .030 lingual tubes and the appliance is automatically reactivated. In extremely constricted lower arches a third lingual arch wire may be required. If so the same procedure is followed but the size of the wire remains at .016.

Lingual Buttons:

At least one lingual button must be used with the Williams Appliance. The basic rule is to place the button on the most instanding lower incisor. If the central incisor is the most instanding then one button is sufficient. If the lateral incisors are the most instanding then bilateral buttons should be employed. The vertical position of the button is extremely important. The button must be bonded as far gingival as possible. This places the lingual force on the incisors close to the fulcrum that is created within the bone. By keeping the force gingival the incisors will not tip and the reciprocal force will continue to increase the lower arch length. Sometimes an incisor will be either "blocked out" or extremely instanding to the point that the

appliance can not be properly fabricated. When this situation occurs the single incisor remains untreated until full arch development has been obtained. At that point a button is placed on the remaining incisor and a .014 lingual arch wire is used to correctly align the tooth.

Retention:

After lower arch development is completed the Williams Appliance can be used as a fixed lingual retainer. If no further orthopedic therapy is required the retention period is usually six months. Otherwise additional treatment can begin immediately following the Williams, such as mandibular translation. The Williams appliance can be replaced with either a fixed or removable lingual retainer to enhance patient comfort and hygiene.

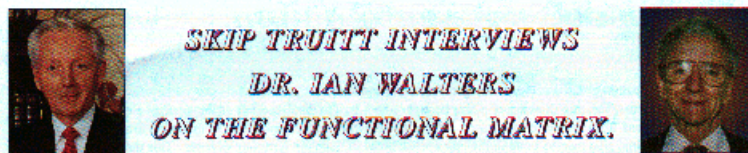
Clinical Tips:

- Constantly monitor the labial gingival attachment on the incisors that have the button supporting the lingual arch wire. If any gingival recession is observed, immediately reduce the length of the lingual arch wire, which will reduce its force upon the tooth.
- The lower incisors should not excessively procline. Should "tipping" occur reduce the length of the lingual arch wire.
- Keep the buttons as gingival as possible. Buttons may need to be replaced as the incisors erupt.
- Do not over seat the mesial of the molar bands. This can cause the lingual arch wire to impinge on the soft tissue below the buttons. This also makes it very difficult to remove the lingual arch wire without removing the entire appliance.
- Do not use thermal activated Niti arch wire. Something cold can make the wire become soft and it can be lost from the appliance.
- Do not use a lingual arch wire longer than .016. A longer wire will create excessive force within the appliance.
- Watch for permanent bicuspid erupting under the lingual bar. Should this occur use a .016 Nih segmented arch wire from the permanent first molar to the cuspid to move the bicuspid in a buccal direction.

N.A.O.L. has made a number of modifications to the original Williams Appliance that make it easier to place and adjust as well as make it more effective. Please feel free to contact us should you have any questions about this fantastic appliance.

-Dr. J.W. "Skip" Truitt

NAOL is now working in conjunction with Imaging Systems, Inc. in an effort to improve the quality of X-Rays used to make our Cephalometric Tracings. For more information please contact Lauri Tracy at 1-800-843-3558.



DR. TRUITT:

You mentioned to me that you had been working on a new definition of orthopaedics and orthodontics based on Moss's concept of the functional matrix. What is the basis of it?

DR. WALTERS:

Well, first of all we have to restate Moss's original postulate, which has completely revitalized the current approach to the craniofacial biology. It forms a basis and rationale for the practice of dentofacial orthopaedics. It simply states that: "In regards to skeletal tissue, its origin, its change in size and form, its maintenance and even its continued existence is dependent on, and is secondary, compensatory, and obligatory to prior events and processes occurring in the non skeletal tissues and functioning spaces, what we now know as the functional matrix. It comprises all of the non skeletal tissues and most importantly the oronasopharyngeal functioning spaces.

DR. TRUITT:

Of course this is revolutionary, it means that as far as the skeletal elements themselves are concerned, there is no direct genetic predetermination of absolute size or form.

DR. WALTERS:

Precisely, and this removes one of the single greatest restraints under which the traditional orthodontists have been working, in that they resigned themselves to the belief that they were confronted with a situation where the size and form of the dental arches was genetically determined and beyond therapeutic control. However, the genome does determine a range of species specific forms and ultimate limitations on size, with final outcome being determined by environmental or epigenetic factors. Moss appears to have shown that whatever genetic controls are working in the craniofacial region, they are placed at least on remove from the bone itself. Therefore, the facial skeleton and the dental arches, are both very susceptible to adverse

environmental influences, and quite responsive to orthopaedic intervention, and the removal of noxious insults.

DR. TRUITT

It is gratifying to have an explanation of the consistent success of our treatment. Can you explain what is meant exactly by the term "Functional Matrix"?

DR. WALTERS:

First it is crucial to understand that the functional matrix comprises two separate entities, the capsular matrix and the periosteal matrix, and I will explain the importance of these a little later.

DR. TRUITT:

You mentioned functioning spaces. How does a space grow? It seems a difficult concept to understand.

DR. WALTERS:

Not really, it appears that the spaces grow and develop their form simply by invaginations and growth of epithelium. We can see this happening very clearly when the respiratory mucosa invades the maxillary body to form the maxillary sinuses, starting at about age 6.

DR. TRUITT:

Where is the growth control?

DR. WALTERS:

It appears that the growth of the epithelium is under the control of neurotropic substances released at afferent nerve endings.

DR. TRUITT:

So how do the capsular and periosteal matrices fit into the scheme of things?

DR. WALTERS:

The functions mentioned previously are mediated through organs or spaces (the matrices) which are considered to be housed in capsules, hence capsular matrix. For instance, the brain is a capsular matrix housed in the neurocranial capsule, the eye is a capsular matrix housed in the optic capsule, and the oronasopharyngeal functioning space is a capsular matrix housed in the orofacial capsule.

DR. TRUITT

And the periosteal matrix?

DR. WALTERS:

We can see that all the capsules have walls, and embedded in these walls are the skeletal elements of bone and muscle to give support and protection. The interface between the bone and the muscle is the periosteum. The periosteum is all encompassing. It entirely ensheaths the bones, it forms the sutural membranes, it extends down into the alveolus as the periodontal ligament, it invades the furthest interior of the bone as endosteum, and in a slightly modified form it clothes the mandibular condyles.

DR. TRUITT:

That is interesting, but what is the significance of this subdivision of the functional matrix?

DR. WALTERS:

It has far reaching implications involving two entirely different categories of growth, which Moss refers to as translative growth and transformative (remodeling) growth. Translative growth is mediated by the capsular matrix and transformative growth by the periosteal matrix. It works this way. The rapid growth of capsular matrices such as the brain, the eye, and the nasopharyngeal space spread the bones of the craniofacial region apart in all directions, much like the concept of an expanding universe! It is the growth of the capsular matrices which is the prime mover, the engine of craniofacial growth. This rapid increase in size brought about by the displacement of the skeletal elements evokes an immediate response from the periosteal matrix which lays down bone by apposition, to maintain structural continuity and at the same time also resorbs bone in the appropriate areas to maintain harmony of form. This then is the transformative or remodeling process under the control of the periosteal matrix. Thus it can be said that translative growth due to the capsular matrix is primary, and transformative growth controlled by the periosteal matrix is secondary.

DR. TRUITT:

So translative growth is responsible for the overall increase in size of the craniofacial region?

DR. WALTERS:

Yes, but that is not to deny the importance of the periosteal matrix without which the harmonious proportions of the entire complex would soon be severely disturbed. Furthermore, the magnitude of change mediated by the periosteal matrix should not be underestimated. For instance, the entire ramus of the mandible represents bone which has been laid down by the transformative process of the periosteal matrix. In the growing face the mandible is carried down and forward by the rapidly expanding oronasopharyngeal functioning space, even in the absence of the mandibular condyles, which are not growth centres, but merely sites for secondary adjustment. During this translation the original ramus is remodeled to become that part of the body of the mandible to accommodate the permanent molar teeth, while a completely new ramus is being formed through apposition by the periosteal matrix.

DR. TRUITT:

So how do you relate this to your new definition of orthopaedics and orthodontics?

DR. WALTERS:

Simply this. When we use a functional appliance such as a bionator, and we are translating the mandible, then we are engaging, or activating the capsular matrix and we can think of our appliance as a prosthetic capsular matrix. We see the same thing with a Schwarz appliance. When activated, slowly and carefully, it translates the two maxillae causing tension in the mid-palatal suture inducing increased growth. This is a manifestation of the capsular matrix, which is normally elicited by the proper positioning and function of the tongue. It is this manipulation of the capsular matrix that we should properly call "orthopedics."

DR. TRUITT:

And orthodontics?

DR. WALTERS:

Where ever we merely push, pull or twist a tooth, by exerting a force on it by some form of spring or arch wire, we are impinging only on the periodontal ligament, and we are effecting only the local resorption or apposition of bone, that is we are stimulating only the periosteal matrix, and we should properly describe this manoeuvre as "orthodontic."

DR. TRUITT:

That is the most illuminating explanation and definition of the distinction between orthopaedics and orthodontics that I have seen suggested. Have you discussed this idea with Professor Moss?

DR. WALTERS:

Yes, I flew from London to New York last autumn, and made this suggestion to Professor Moss at Columbia University. He agreed with it and wrote to me saying that it completely represents the dynamics involved. He has recently used the term "prosthetic functional matrix" to describe all orthopedic and orthodontic appliances.

DR. TRUITT:

I believe that you have made a valuable contribution to the direct clinical appreciation and application of Moss's work. It adds considerably to our ability to understand the rationale of the use of our entire armamentarium of fixed and removable appliances. I feel that it is important that you should document your references and submit this material as a formal article to one of the major journals. The American Journal of Orthodontics has always been ready to publish Melvin Moss's writing and would be sure to be interested in this further development of it.

DR. WALTERS:

Thank you for those remarks. It is interesting to analyze some of our appliance therapy in the light of this concept. Let us consider the Frankel 3R function regulator for instance. Firstly, we can see that it activates the capsular matrix indirectly, simply by removing the buccal pressure of the vestibular musculature, thus allowing the tongue to be more effective in translating the maxillae transversely. At the same time the vestibular shields and lip pads, if correctly designed will stretch the periosteum and evoke a direct response from the periosteal matrix.

To Be Continued in The Next Issue of The N.A.O.L. Newsletter