Clinical Perspective

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The Importance of the Axis in the Study of Oromyofunctional Disorders — An Integrated Approach

Beatriz de Almeida Rego Saboya

This is the original publication of a paper presented by the author at the First International Congress of Professionals in Phonoaudiology in Rio de Janeiro, 1983.

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The absence of harmony and of flexibility of the tongue and mandible is generally associated with disharmony and lack of flexibility at the level of the head and neck. At the same time, the lack of harmony and of flexibility at these levels is, in general, associated with static and/or dynamic disharmony of the axis.

In Portuguese, "harmony" signifies "Ordered dispersion of each of the parts of the whole," and "dys" is a "prefix of negation." "Axis" comes from the Greek "axon" and refers to the actual or imagined longitudinal line that divides the human body in approximately symmetrical or balanced parts. It also designates a support or line on which an object supposedly or factually makes rotations. On the other hand, it signifies in its origin, the second cervical vertebra, but in this publication, it is not used in this sense.

The author, having worked for twenty years with oromyofunctional problems, has observed in the clinic and in diagnostic sessions, that, in about 60% of the cases with oromyofunctional disharmony, there exists a parallel disharmony at the level of the axis. This article studies the evolution of the ontogenetic axis and phylogenetically points out certain coincidences that occur at about the age of 14 months, at which stage, for example, the spinal column acquires a fourth "curve of harmony" and begins its passage toward the mature patterns of swallowing and mastication. In addition to the theoretical assumptions, the article describes the technical approach to diagnostic procedures.

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INTRODUCTION

Before addressing the theme which I propose to treat, I would like to tell what led me to this presentation.

Working for more than 20 years as a therapist with persons with communication disorders, I learned many things - from my observations, my assumptions, my errors, and my reflections.

In science, the distinguished Armando Cavanho teaches us, "He who researches must reason, and he who reasons must research."

Among the various oral communication problems, we find some dyslalies characterized by imprecise articulatory contact, causing phonetic distortions called interdental and lateral lisps. Those who deal with these problems know that, without exaggeration, about 70% of the time, they are accompanied by abnormal swallowing behaviors.

It is regarding abnormal swallowing that I want to direct myself, writing those things I have learned. My mistakes, I learn more and more each day, are, in general, the result of fragmented views in the analysis of the problems that confront me.

Currently, still the fruit of decartian and dualistic views, we encounter currents, be they organotropic, or be they psychotropic, that carry man away from his wholeness, and view him either as a body or as a psyche. I do not analyze the constant reconciliation existent in the interaction of these two aspects. An even graver error, a thousand times more unacceptable, would be to subdivide these two levels, the body and the psyche, into various compartments that do not communicate among themselves.

To illustrate this unhappy reality, I want to cite the case of child A, an eight-year old girl with an abnormal swallowing pattern and with disharmony of the axis. The team that attended to her, concerned with the axis, analyzed form and func-

tion and cause and effect, and decided to refer to an orthopedist to complete evaluation and carry out the therapeutic plan. The referral was made with the approval of the speech pathologist and physical therapist. After the consultation, we received the following report from the doctor. "The curvature of the spinal column and the lordosis exist, but have nothing to do with the head and its functions. The relationship this team attempted to make is erroneous. They treat the swallowing problem by itself, because the spinal column has nothing to do with the head."

This example, although unusual and exceptional, gives us a vision of what can happen when a professional, or a team, attempts an integrated focus in the evaluation, diagnosis, and therapy of a communication disorder.

I believe that at the forefront of other problems that confront us in the biological area, in the majority of cases, even those that are much more complex than an oromyofunctional dysfunction, we run the risk of taking great chances and making grave errors whenever we analyze man fragmentally. To ignore variables that we know to be influential in a determined syndrome, principally when we attempt to act on them, is absurd.

It is logical that human knowledge has increased so much that it has become difficult for one person to know everything. This fact, along with socio-political needs, led to the creation of professional specialties. In the meantime, we must not permit these incontestable facts to cut human beings into pieces. We must be careful in our observations, and in our daily toil we must be on the lookout, always as necessary for the contributions and help of other areas of knowledge and of other professionals. Only in this manner will we not lose the vision of man as a psychosomatic totality; we must try to follow an integrated approach.

It is in this sense that I title my report "The Importance of the Axis in the Study of Oromyofunctional Disorders - An Integrated Approach."

CHARACTERIZATION OF THE PROBLEM AT THE FRAGMENTED LEVEL IN THE HEAD

Richard H. Barrett and Marvin L. Hanson, in the book *Oral Myofunctional Disorders*, give an historical account of what has been studied, written, and accomplished since 1907 by different professionals, to diagnose, co-relate etiologically with malocclusion, and correct the so-called "tongue thrust syndrome."

Until 1960, all the studies were done by dentists, and the only exceptions were the speech pathologist, T.R. Francis, and the astute specialist in the ear, nose and throat, Gwynne-Evans, both from England.

ENGLAND: In England, Rix, Ballard, Gwynne-Evans, Ardran, Tulley, Kemp and Leech, studied, researched, and published their works:

- a. describing atypical swallowing in its different forms;
- b. doing incidence studies in different age groups;
- c. showing the percentage of malocclusions related to atypical swallowing;
- d. rejecting the ideas prevalent until that time that mouth breathing was the predominant etiologic factor in malocclusions.

Tulley was one of these pioneers, the only one to accept the viability of therapy for atypical swallowing, but, nevertheless, he took a skeptical position of its efficacy, for he said that, in fact, the patient swallows normally only in the presence of the therapist.

U.S.A.: In the United States, Edward Angle (1895-1907) who, according to Barrett and Hanson was part dentist and part artist, referred to atypical swallowing as "this pernicious habit that disrupts the harmony of dental occlusion."

Lisher, his contemporary and opponent, contended that the tongue solely acted as a causal factor in malocclusions when it was too large or too small. He asserted that, yes, the acts of sucking a finger or chewing the lips, as well as mouth breathing, are etiological factors.

His study, meanwhile, was novel in that it

showed occlusions in different civilizations. He related, for example, that the majority of the Chinese have harmonious occlusions, whereas this is not true among the Hawaiians.

It was deserving of our attention in the sense that we had not given much weight to the effects of civilization, considering it only as a "frequent concomitant of irregularities." It seems to me that he intended to say that when we speak of civilization, we refer more to time, largely ignoring the factor of space.

Rogers (1918-1955) was the first to propose a functional correction of the muscles, pointing out that body posture and muscular imbalance are causal factors in atypical swallowing. Meanwhile, the therapeutic regimen was restricted to working the intrinsic muscles of the tongue, and the masseter, temporalis, and orbicularis oris. In his publications he did not point to atypical swallowing as a causal factor in malocclusions.

During this period, prostheses were developed that presumed to combat "bad habits", one of which was atypical swallowing.

In 1960, with Straub, atypical swallowing came to be studied as a causal factor in malocclusions; also studied were the causal factors of the atypical swallowing itself. Straub also developed the first systematic work on its corrections.

After Straub, Moyers and Ricketts, also dentists, studied atypical swallowing; but, the first speech therapist to become interested in the problem was Harrington, who listed three etiologic factors:

1. Chronic nasal congestion accompanied by velopharyngeal dysfunction.
2. Digit-sucking.
3. Bad alimentation habits such as the eating of soft foods during infancy.

Reviewing these 60 years of studies we see that the authors studied atypical swallowing in terms of its symptoms, its etiology, and its progression - all these - in the *head*. We cannot fail to single out the two exceptions: Lisher, who concerned himself with the occurrence of malocclusions in different civilizations, and Rogers, who affirmed the importance of body posture, but re-

stricted himself to citing it; he did not descend to the clinical level in his studies of this variable at the symptomatic, diagnostic, and therapeutic levels. In reality, Rogers kept returning, above all in the clinic, to oral prostheses and to exercises that dealt with specific muscles.

HISTORY OF THERAPEUTIC APPROACHES

Many therapeutic approaches have been employed in the attempt to correct atypical swallowing.

The authors, in general, describe the indications, contraindications, successes and failures.

Let us look, in a succinct manner, at these approaches:

1. *Prostheses.*

- A. Placed in front of the incisors to discourage lip-sucking.
- B. Placed in front of and behind the incisors to discourage the tongue and lips from touching the teeth.
- C. Other prostheses were created to help prevent contact between the organs, and were placed on the palate, on the gingiva (on the vestibular surfaces as much as on the lingual surfaces).
- D. Electrical apparatuses, for use during the night, for the purpose of producing a light shock whenever the tongue touches the incisors.

2. *Hypnotherapy.*

Hypnotherapy was tried in serious cases, with success, by Crowther and Barrett.

3. *Surgery.*

The genioglossus muscle was partially detached, or a portion of it removed, in order to diminish the strength of the lingual protrusion. According to research, lingual pressures in some individuals was reduced from 4.83 to 3.22.

4. *Oral Myofunctional.*

According to the accounts and publications, oromyofunctional procedures appeared in the following chronology:

- 1951 - Straub
- 1961 - Barrett
- 1964 - Garliner
- 1964 - Whitman (who attributes his work to an old French text from 1840).
- 1968 - Goda
- 1969 - Saboya
- 1973 - Zickefoose and Hanson
- 1973 - Pierce and Warvi
- 1976 - Padovan

A detailed study of these approaches shows us that all of them function basically at a fragmental level, in the head. Specific exceptions must be made of two procedures: We were working with respiration and sensation as early as 1969. Padovan combined his oromyofunctional therapy and neurological reorganization as he also does for other dysfunctions and pathologies.

What I want to review today is the position that was adopted from the methodological and technical points of view for the first time at the First Brazilian Congress of Speech Therapy (1969) and which I reviewed with some modifications in 1974 at the Third Brazilian Congress of Speech Therapy.

Since that time, and principally during the last three years, our observations in the clinic led us to modify this approach (I speak here in behalf of the team because the observations were not only mine but also those of the speech pathologists that were working with me at the Reeducation Center of Ipanema).

In practice, the following occurred: A lack of harmony or flexibility of the tongue, lips, palate, and mandible was, in general, associated with a disharmony and lack of flexibility at the levels of the head and neck. In turn, this lack of harmony and flexibility of the head and neck was associated with a disharmony in the static and/or dynamic aspects of the axis.

It is important to emphasize that we have noted this abnormality not only in cases of atypical swallowing.

In reality we had verified that certain patients with atypical swallowing also had a different type of posture. This caused us to give this fact greater attention during therapy. We began to work with the objective of trying to give the person better posture, and, at the same time, a better dissociation

of the movements of the head, neck, shoulders, and vertebral column.

What we had at first observed in the clinic we now began to verify in a systematic manner, during our initial evaluations, with respect to the static and dynamic axis, along with the other examinations that we were already making.

The anatomic-physiologic axis has taught me a great deal, even to the extent of making me want to become an "Axologist." It was as though I had a new facet in my eyes, such as those possessed by insects.

This is what Cavanha says: "To know should not result in squinting, myopia, or impairment of vision. It should, if possible, equate itself to the eyes of those insects that face reality with very diverse optical angles. It will be a many-sided, mobile, insatiable vision, and above all a scrutinizing vision."

It is an integrated approach turned toward the axis, that we have modified our clinical posture as a result of our diagnostic evaluations and therapies, not only with respect to the pathologies classically grouped in the "somatic" area, but also in the so-called "ambiogenic disorders."

THE AXIS AND ITS EVOLUTION

It is logical that we cannot limit this study of the axis in articulatory problems to empirical bases. I believe that we must reason from our experiences and observations and turn to experimentation after reflection to enable us to call it science.

Reflecting a little about phylogeny and ontogeny, and naturally fixating on the axis, I found some coincidences and correlations that stopped me dead in my tracks. By this, I mean that I found concrete bases for my reasoning, since my philosophy of work centers itself on a developmental¹ track within a dialectic² viewpoint.

¹ Developmentalist: Line of work in which an attempt is made to understand the history of the individual; to secure a profile, taking into account the development considered desirable or normal, verify at what point occurred a blockage and at what level the individual presently is. From these data, an attempt is made to learn why the individual is blocked or arrested at this level, and finally, formulate a plan of work that will permit the individual to overcome the blockage and proceed with as normal or healthful a development as possible.

² Dialectic: Considering it as a philosophy of work, the dynamics of which, attempts to see the findings as immersed in a process of constant change with permanent interrelations between man and his environment.

PHYLOGENY

The study of phylogeny in vertebrates teaches us:

- 1st: That the axis evolved from the horizontal to the vertical with consequent cranial suspension.
- 2nd: That the axis evolved from immobility (the head does not demonstrate freedom of movement from the vertical column) toward a great degree of flexibility. Associated with the elongation of the spinal column is the increasing independence of the head. Fish, upon lifting the head out of the water, initiate the conquest of the earth. From that point, from crawling, we progress to walking. Passing through quadropedia, through walking erect or the simian state of four "hands", attaining great flexibility of the axis, above a level of the neck.
- 3rd: That the liberation of the mandible appears after the liberation of the head. In amphibiomorphism (liberation from the aquatic medium) the head has almost no freedom in the same manner as the mandible. In the Sau-riens (reptiles, lizards, etc.) the head is already separated from the spinal column and occupies the extremity of the neck. The musculature of the mandible and the hyoid bone appear, permitting the mobilization of the lower jaw and of the tongue. In the terromorphism (transformation of the reptiles, into mammals), the head acquires motoric independence and heterodontia is introduced together with significant postural modifications. The masticatory-respiratory pattern appears, being a much more elaborate mastication. Progressing from pitecomorphism (seated posture) to anthropomorphism (bipedism) the mandible is liberated in all its movements. Anatomically, there is reduction of the face, of prognathism, of molars, and of premolars, associated with cranial expansion.
- 4th: That the inclination of the head in relation to the axis coincides with the proportions of the face/cranium/enkephalus.

From sauromorphism to anthropomorphism the occipital foramen passes from the horizontal to the vertical, raising the head to a more vertical position. On the other hand, half of the anterior part of the head (major) in relation to the posterior (minor) reaches equilibrium in man.

We need to reflect over these facts not only in the morphologic aspect, for we know that it is function that governs form.

Clinically, what interests us more is the functional aspect - the position of the head on the axis and the various bony-muscular deviations that came from this positioning.

ONTOGENESIS

The study of ontogenesis teaches us in relation to the axis:

- 1st: That it is one of the earliest embryological formations, since in the 18th day of gestation is begun the formation of the Notocord process (that will give demarcation to the axis when the internal life is formed). In the 21st day it is already formed.
- 2nd: That the evolution and flexibility of the axis coincides with the first movements of the fetus at about the 3rd month. This occurs when the flexion of the head is reduced and the neck is elongated, appearing nearly at the same time as the first movements. In the 4th month the fetus already is placing the finger in the mouth.
- 3rd: That the curvatures of the axis evolve from two (at the moment of birth) to four (a little after the beginning of walking), coinciding with important gains at oroneuromotor and relational levels.

NOTE:

In the fifth week of intra-uterine life the axis is markedly bent backwards. In the 6th week the curvature diminishes, the flexion of the head being reduced in the 7th and 8th weeks and the neck elongated. In the 3rd month the head is more extended and in the 4th month the spinal column is extended a little more. At birth the infant displays barely two primary curves - the same as in fetal life - the

thoracic and the sacral. The secondary curvatures - the cervical and the lumbar - only begin to be formed after birth. They are concave posteriorly and compensate for the primary curves - the cervical is formed when the infant is able to support the head and rotate it. The lumbar is formed and accented with the erect posture. Observation: In this aspect, and phylogenetically, we need to point out that the four curvatures are characteristic of homo sapiens, since primates possess only two curvatures.

- 4th: That the manner of inclination of the lower border of the mandible shows a correlation with the posture if we look at man in his life-curve - from birth to senescence.

Mastication appears to pass through this same curve. It begins vertically (before the emergence of the molars), passes through the masticatory phase, with circular movements of the mandible and experiences a regression in the vertical direction in old age.

Seeing the evolution of the axis, from the phylogenetic and ontogenetic points of view, I believe that we can trace certain parallels making at least the following correlation:

The verticalization of the axis (phylogenetically as well as ontogenetically), permits a greater independence of movements not only at the level of the axis itself, but also at the levels of the mandible, lips, and tongue.

To conclude, we would like to emphasize some coincidences that seem to us to be highly relevant. We have already reflected on them, but we need to reflect even more, search into our practices even more, because doing so will give us extraordinary references and assistance.

I believe that it will not be by chance that certain facts occur at the same time. A logical reason exists for this.

Could the facts that we will review be connected to a common root?

Might they be related to one another even if they did not have a common root?

Could there be a mutual dependence on their simultaneous emergence?

Let us consider the facts that coincide temporally and appear between 14 and 18 months of age:

Progression toward the second pattern of swallowing.

Bipedism with the installation of the secondary lumbar curve of the axis.

The emergence of the molars.

Biting and chewing coming under cortical control.

Independence of the movements of the head (the shoulders and the rest of the body do not participate in block form.)

Mandibular-maxillary occlusion.

The appearance of the masticatory phase.

The first words.

The enlargement of the oral cavity.

The individualization of the infant and a major independence between mother and child.

Returning to the beginning, to our observations and experiences, to the point of departure of our inquiry, I believe that we can now understand why *some* oromyofunctional dysfunctions present in parallel fashion; perhaps, originally, we may conjecture a disharmony in the axis.

It is not by chance, I am certain, that we find this parallelism. Closer observation, more reflection, more experimentation, more studies on these coincidences are necessary.

On the other hand, I don't want to make of the diagnostic process, the etiology, and the therapy for oromyofunctional dysfunctions a panacea.

It is logical that the study of the origin and history of the individual will teach us that not all oromyofunctional disturbances have to do with a disharmony in the axis.

In our statistics, about 60% of the patients with atypical swallowing have an irregularity of the axis. We note that patients who have the head habitually inclined forward and downward demonstrate a *tendency* toward a class III and those who have the head fixed more toward the back tend toward a class II.

Observation: It is easy to verify this affirmation. To do so it is enough to perceive the changes in contact that occur when we do a ventroflexion or a retroflexion of the head.

We do not include in this study people with severe pathologies, such as cerebral paralysis. Our statistics involve persons who walk and run, in general, in a normal manner.

In accordance with our observations, we can say that when we pay attention only to oromyofunctional abilities and to respiration, therapy does not produce the same results that we get now, when we include work with the axis at the beginning of the program of rehabilitation, given the existence of an irregularity. We observe also that therapeutic time is shortened, above all in the automatization phase of the new habits (swallowing and articulation).

We are attempting to verify when and how the disharmony of the axis and oromyofunctional problems, occur, and if they are always related or not.

On the other hand, it appears to us that disharmonies of the axis that begin after a certain age (example: adolescence) do not directly cause severe oromyofunctional problems.

AN INTEGRATED APPROACH TO THE EVALUATION, DIAGNOSIS, AND TREATMENT OF OROMYOFUNCTIONAL DISORDERS

In the initial evaluation we verify the following aspects in order to derive a profile:

1. History.
2. Axis.
 - static
 - dynamic
3. Respiration.
4. Habits.
5. Orofacial musculature.
6. Diadochokinesis.
7. Stereognosia and topognosia.
8. Orovegetative function.
 - Swallowing
 - Mastication
9. Tongue posture at rest.
10. Articulation.
11. Auditory discrimination (when articulatory problems exist.)

Within the objectives and limits of this work,

I find it unnecessary to comment on these items of the evaluation, and find it necessary only to explain the analysis of the axis; this is what we are concerned about at the moment. The axis appears to delimit, on the first level, the potentialities and restrictions of the individual.

THE STATIC AXIS

Natural

1. We observe the individual standing and sitting. (views: anterior, posterior, and profiles from the left and right sides) in spontaneous activities, and note:
 - a. From anterior and posterior aspects the asymmetries that exist, beginning with the support (feet and hips), up to the head.
 - b. In the profile views (right and left hand), the absence of curves of harmony of the axis (cervical, dorsal, lumbar, and sacral).

Formal

We leave the formal evaluation, that which is done by lens, to the second part of the examination, generally the second session of the evaluation. This is done, as in the natural examination, from the front, back, and left and right profiles, and deviations and asymmetries are noted.

It is important to make clear that the examination through lens, although it is the approach classically adopted in the evaluation of posture, has been shown to be insufficient for our study. What happens is that the individual, upon simply seeing the apparatus (lens, tripod, plumb line, camera and related protocol) always adopts a posture different from his natural one, more vertical.

For work with the axis, the natural posture evaluation has been shown to be more important than other data furnished to us. However, evaluation through the lens shows us the deviations and asymmetries that are more fixed, and therefore more difficult to compensate for.

These deficits lead us, by their compromises, to a physical therapy supervision, or in some cases, shows that physical therapy has high priority and must precede oromyofunctional therapy.

In the evaluation of the profile (through the lens), the observations depend, above all, on coincidence, a plumb line, on the following points:

1. auditory canal
2. head of the humerus
3. body of the 5th lumbar vertebra
4. head of the femur
5. knee
6. external malleolus of the foot

The Dynamic Axis

1. Natural.

Observations made during dynamic activities: running, walking, and jumping with feet together.

2. Movement of Segments Following a Model.

The therapist demonstrates for the client the movements necessary in order to ascertain the possibilities of harmonious and independent movement of various segments of the axis.

A. Flexibility of the head and neck.

The independence and amplitude of the movements of the head and neck in relation to the trunk are verified in this series of movements. The shoulders and the dorsal spinal column should not participate in the solicited movements.

A1. Flexion of the head to the right - and to the left with the gaze directed forward and the ear drawing near to the shoulder (anteroposterior axis X).

A2. Flexion of the head to the left and right while looking above the shoulders (vertical axis Y).

A3. Flexion of the head to the front and to the back (horizontal axis Z).

B. Flexibility of the trunk.

The movements are carried out starting from a vertical position with the feet parallel and separated. The body should be relaxed as though in free conversation.

B1. Flexion to the front.

Flex the body forward in the following sequence: head, neck, back, hips, thighs, and, finally, knees and ankles. The movements should be made slowly and harmoniously.

B2. Lateral flexion.

Flexion of the axis toward the right and toward the left in the following sequence: Head, trunk, shoulders, waist, hips (initial position equal to B1).

B3. Posterior flexion.

(Position equal to B1, but with the arms raised and apart). The amplitude of the posterior flexion, obviously, is much more reduced than the anterior.

The diagnosis consists of the synthesis of the evaluation and the statement of the probable etiology.

Therapy is prescribed according to the profile and based on a global plan that determines the intermediary objectives to be reached.

When a problem in the axis is detected, therapy is begun working with posture and flexibility. If necessary, the speech/language pathologist works with the supervision of the physical therapist. When the pathology of the axis is more severe, the patient is attended to previously, and in turns simultaneously, by the physical therapist.

We would like to emphasize that above all, when in front of a patient, we are always sure to reflect over the following questions:

Who has the problem?

What type of problem is it?

Why does he have the problem?

Finally, we are aware that we are giving barely the first steps in the study of the axis and its correlates. Much needs yet to be studied and we are prepared to do it.

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