Neck posture, cervical spine problems, temporomandibular joints and the Anthropometric Ergonomic Biomechanical (A.E.B.) Method

Tiziano Pacini

Neck posture, cervical spine problems, temporomandibular joints and the Anthropometric Ergonomic Biomechanical (A.E.B.) Method: *21 persons with temporomandibular and postural disorders were treated using the Anthropometric Ergonomic Biomechanical method.It is shown that the stomatognathic system is an area of complex interchanges and relations between forces that involve the harmony of overall gravitational control, and posture.*

Key words: *Posture, Anthropometric Ergonomic Biomechanical Method, temporomandibular joint, malocclusion.*

INTRODUCTION

The living environments of Western populations affect their posture. Among Westerners, when standing erect, the general barycenter (or center of mass, or center of gravity) of the body is slightly posterior with respect to the ergonomically correct values [1]. The earliest consequence that is at the beginning of our postural history when we start walking early in childhood is that we carry our head forward with respect to the body in order to compensate and not fall backwards.

There is no need for scientific tests to prove that we humans, at least those of us in the West, carry our heads forward with respect to our bodies – it is sufficient to look at pictures of ourselves.

However, questions do arise: how do different head positions lead to postural differences and to what extent can they interact with the management of the gravitational field? And especially, can these diversities be important factors in well-being?

In a previous article [6] we considered the upper partial center of gravity of the body (B_S) relative to the upper part and we can see that it is generally located around the first dorsal vertebra. If we draw a vertical line between B_S and the body's general center of gravity (B_G), we should find them perfectly aligned (Fig.1). Otherwise there would be horizontal forces on the sagital plane directly posterior or anterior with respect to the body, according to how the spinal column, with all of its supporting muscles, behaves Fig. 2 and Fig. 3.

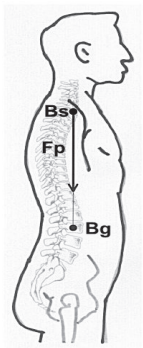

Fig.1

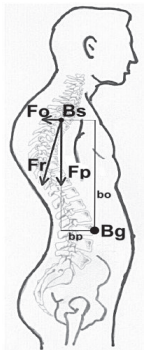

Fig.2

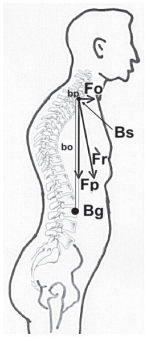

Fig.3

DISCUSSION

These different behaviors of the dorsal-cervical tract shown in the figures lead to different compensatory reactions in the dorsal-lumbar section and then the pelvis and feet.

Clearly, the three postural systems in the figures also involve different compensations in the tract that concerns cervical lordosis. They are coherent with a malocclusion in the temporomandibular articulation (TMA). This obviously involves all the muscles of the neck and mouth.

In our above mentioned article, we studied how the weight force related to the head and trunk is presented and broken down according to the position of the dorsal-cervical tract and we studied what happens along the entire spinal column.

The aim of this study is to understand the behavior of the cervical tract in determining head position in the above situations, and how to intervene in order to achieve a Euposture, (the posture with maximum ergonomic efficiency) without direct dental treatment of the malocclusion.

The cervical tract and hence the neck consist of a complex group of muscles, essentially an anterior zone on the hyoid and mandible which must work in harmony with those of the posterior zone.

As opposed to the muscles at the back of the neck, the anterior muscles are not connected to a stationary point on the head, but rather to a mobile zone that must perform several functions.

In fact, the anterior neck muscles terminate at the mandible and therefore contribute to the posture of the cervical tract with much greater complexity since the anterior muscles do not have a fixed point of attachment at either end, but have a fixed and a variable one because they are attached to fluctuating mandible, Fig. 4.

Fig 4. Muscles of the neck

Even when the mandible is stationary, that is with the occlusal plane closed, it is affected by the intrinsic position of the closed bite.

Then, there are the sternocleidomastoid muscles transversally between the anterior and posterior zones. Simultaneous contraction of these muscles leads to two fundamental and diverse conditions:

- if the cervical spine is capable of maintaining its lordosis, the muscle contractions contribute to maintaining the position and extending the head upwards;

- if however, the cervical spine has reduced lordosis or is straight or sometimes inverted, usually caused by the different effects of the paravertebral muscles, their contraction contributes to the backward flexion of the cervical spine and forward flexion of the head.

There is also a third possibility: the cervical spine becomes hyperlordotic and there is backward flexion which, however, is only noticeable in the last cervical vertebrae. This situation is typical of people who present the so-called sternal carina (sternum and clavicle protrude more than usual with hyperkyphosis of the first dorsal vertebrae).

Head and cervical spine position are controlled by the neck, and apparently by the neck alone.

The masticatory and deglutition system, technically the Stomatognathic System, has an enormous impact on posture and affects it by perceiving the alterations or by actually altering it. From the postural ergonomic standpoint, there are no more or less important issues, they are completely mixed.

"The stomatognathic apparatus is an integrated system whose three components, the temporomandibular joints, the masticatory musculature and the dental-periondontal structures are closely related and affect each other" [2].

"The occlusal plane is nothing other than the result of the maxillary and mandibular planes which are outgrowths of the underlying bony planes, and hence of the sacral cranial component. Therefore, mastication can influence the sacral cranial component. Conversely, the sacral cranial component influences the development of the masticatory pattern" [3].

The correct head position requires that the three horizontal reference lines be parallel:

- the line connecting the pupils
- the line connecting the vestibules
- the line passing through the occlusal plane [4].

As mentioned, jaw positions are controlled by the masticatory muscles and the entire system becomes very complicated during deglutition which is a different postural situation with respect to mastication since it involves the entire neck in a different way.

The neck muscles are recruited by the brain, taking into account a complexity that requires great refinement and harmony in an area where there are many significant variables created on and by the occlusal plane.

According to different occlusal situations, but in particular when the heights of the arches is reduced at the back, we can see that all the anterior muscle groups of the neck tend to contribute to moving the head downwards.

This has to be counterbalanced, and it is mainly the sternocleidomastoid muscles that are recruited in the attempt to bring the head back to its correct position. Walter Zamparelli described this mechanism which reduces and sometimes leads to the complete elimination of what he called the **"***Stomatognathic Parachute"* [*Paracadute Stomatognatico*].

The *Stomatognathic Parachute* is the height of the occlusal plane in the molar area that keeps the working fulcrum of the pterygoid muscles drawn back. This permits recruitment of the neck and masticatory muscles that can raise the head, pushing it back and up to restore the correct structure and position of the cervical lordosis.

The effect of the stomatognathic parachute is coherent if the dorsal-lumbar-sacral system is correctly managed from the ergonomic standpoint. This means that the

gravitation field is managed in harmony with the criteria of **eugravitary,** management of the body's center of gravity (with the body in the maximum efficiency posture).

The fulcrum of this situation is located between the 7th cervical and 1st dorsal vertebras. This area, like the lumbar-sacral is particularly subject to inflammation related to structural stress.

Methods. We studied 21 postural cases using the *Anthropometric Ergonomic Biomechanical method* [5] and observed two fundamental postures that we defined as:

Seated on him/herself (with retroverted pelvis) Fig. 5

Hyperlordotic (with anteverted pelvis) Fig. 6

Fig 5. Seated on him/herself.

Fig 6. Hyperlordotic.

The subject seated on him/her has reduced lumbar lordosis; the head position may present with conserved cervical lordosis but with a dorsal-cervical gibbus or with reduced cervical lordosis and the forward head posture.

The hyperlordotic subject has forward head posture and reduced, or sometimes inverted cervical lordosis.

All the cases had been previously treated only by varying the barycenter through podalic conditioning in order to obtain the best possible values according to the A.E.B. protocol.

Then, on the subjects standing erect were adjusted the occlusion heights using elastic materials to further improve the baropodometric values according to the A.E.B. protocol, with the subjects standing still and walking.

There were clear improvements in the protocol values. Above all, the structural differences are evident in the photographs that were taken during the controls: there were improvements in the cervical tract, in the face in terms of the three fundamental lines of the head, and from the esthetic standpoint as well.

Lastly, during the interview all participants said that their improved posture was associated with increased wellness.

CONCLUSION

Posture must always be considered in its entirety, and any study of posture cannot overlook management of the gravitational field and hence the erect position.

The stomatognathic system is an area of complex interchanges and relations between forces that involve the harmony of overall gravitational control that is posture.

Although it is impossible – and inappropriate – to ignore stomatognathic issues in the management of postural problems, it is equally clear that it is not possible to correct the posture of the stomatognathic system alone since the compensating physiological systems

cannot harmonize the body with the gravitational environment which is the primary generator of postural problems.

Even when rehabilitation specialists are involved, they can only work on the muscular-postural system's memories; they can never permit an adaptation to an environment that is unnatural for human posture since that would lead to only temporary improvements in the symptoms because they do no create the new motor engrams that are necessary for continuity.

In order to achieve lasting postural wellness, the system must be adapted to the gravitational environment of the person via interfaces that mimic a correct connection to the ground.

With this study we have shown that the stomatognathic system, fundamental as it is, can also be treated after environmental postural realignment using shunts that prevent the stomatognathic postural memory (malocclusions) from opposing the changes, and possibly restore the heights of the individual's stomatognathic parachute.

REFERENCES

[1] Massara G., Pacini T., Vella G. Ergonomia del sistema posturale, Fabrica del 3°millennio, Marrapese Ed.S.R.L. Roma, 2008.

[2] Mongini F. I fattori etiologici delle algie cranio-faciali in base ad uno studio multidisciplinare. In: Bussone G., Avella F., Cocchini F. (Eds.) Algie Tipiche e Atipiche della Faccia.183-187. Cluster Press, Milano, 1990.

[3] Planas P., Rehabilitacio Neuro – Oclusal (2ed.), Amolca 2008.

[4] Rocabado M., Annette Z.I. Musculoskeletal Approach to Maxillofacial Pain, Lillincott Williams and Wilkins, 1991.

[5] Пачини Т. Биомеханичен, антропометричен и ергономичен метод за контрол на стойката на човешкото тяло. Наука и спорт, 2012.

[6] Пачини Т., Деюлис Е., Коли Е. Взаимодействие между лумбална лордоза и m.iliopsoas. Наука и спорт, 6, 2013.

Contacts:

Tiziano Pacini ul. D. Vatax, 30 -1510 Sofia, Cel: +359878474304, +393355262723, e-mail: tizianopacini@gmail.com

Докладът е рецензиран.