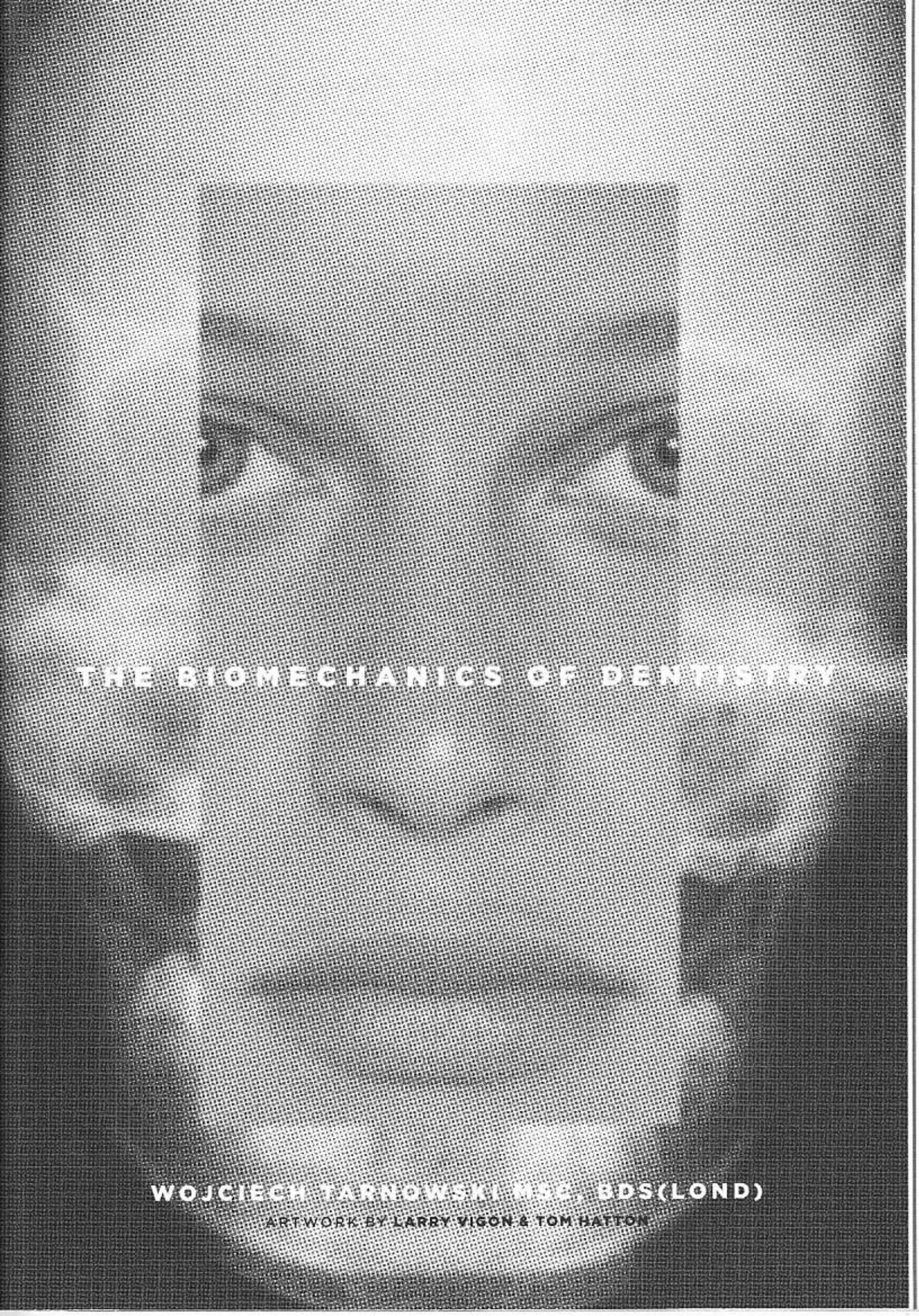
THE BIOMECHANICS OF DENTISTRY
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Many of us have suffered psychophysical stress in a dental chair. Can modern dentistry cause harm? Why do we need to see a dentist? Is it possible to deal with dental problems without conventional dentistry?

Having been a dentist for 50-odd years and having started training in "osteopathy in the cranial field" about 35 years ago, these questions have always been relevant to me. Dentistry is a very mechanical activity in the Western world, and a mystery to most people who have not been trained for the many years necessary to acquire the skills required to work in such a sensitive part of the body. This article is not intended to describe the mechanics of dentistry or go into anatomical or physiological detail, but to point out a link between dentistry and CST. In other words, how dentistry can affect the body, and how work on the body can affect the work of dentists.

Human beings appear to have always had problems with their teeth, either through trauma or disease. However, through most of our recorded history, very little could be done about it except to get rid of the pain by tooth removal. During periods of civilisation, there is evidence that attempts were made to restore teeth for appearance and function but this was confined to the very few rich, simply for lack of technology.

In modern times, it's a very different situation with dentistry no longer in the hands of blacksmiths but in the care of highly trained and skilled surgeons and technicians. Progress has been rapid since the mid-19th century, with dentistry becoming a profession in its own right towards the beginning of the 20th century, with rapidly developing technological solutions and anaesthetics meaning a visit to the dentist need no longer be feared.

How Dentists Work – a whole body perspective

In England, although dentists are legally required to work only in those areas of the head "where dentists normally work", what they do undoubtedly affects the whole body. Most dental work is done in the mouth – on the teeth. They are extracted and replaced, filled, crowned, bridged, root-canalled, bleached and moved around by orthodontists. Most of us have experienced some or all of these treatments. The intention here is not only to remove or prevent pain, but also to improve or restore appearance and function.

It's only within living memory that the speciality of dealing with the periodontal membrane (gums) – its inflammations, infections and diseases – appeared. More recently still, the "Temporo Mandibular Joint" (TMJ) came into the awareness of some in the dental profession, with successful treatments resulting in wondrous cures of all manner of body ailments. A few specialists have now upgraded the name from TMJ to the Cranio Mandibular Joint and some are even working with cranially trained osteopaths and therapists.

So what is the significance of this?

In about 1980, an anatomist called Dr Benjamin Moffett looked at the head from the point of view of not only structure, but also function and use. This implied movement, and so he investigated how force is attenuated through the craniofacial skeleton. Considering the head to be a closed system, Moffett proposed four orders of joints and articulations that enabled the force from the chewing mechanism to be distributed and used throughout the craniofacial complex.

The occlusal articulation – his **Order One**, consists of the occlusal surfaces of the upper and lower teeth coming together through the action of the muscles of mastication (chewing muscles). The masseter muscles, considered the most powerful muscles in the body, can exert a force of up to 2000 pounds per square inch. Americans do not use the metric system but whichever system you use, this is a lot of force.

This force then passes through the periodontal ligaments, which are the membranes that suspend the teeth in the bony sockets and are his **Order Two**. These are highly innervated and supplied with blood, and very similar in structure to the cranial sutures, to the extent that some osteopaths even consider them to be cranial bones.

The force then leads into the maxillary bones and the mandible, which being movable transfers it to the TMJs, which are basically his **Order Three**. The force then arrives at the temporal bones and affects the cranial sutures, which is his **Order Four.**
Here we arrive at the point where all the areas where

dentists work have a direct and indirect influence on the temporal bones and then, by implication, the craniosacral system. What makes the temporal bones so important? It's mainly to do with the Vestibular System and Homeostasis. When the body's Capacity is exceeded, the result is Stress.

What is the Vestibular System?

The vestibules are located in the middle of the labyrinth in the petrous portion of each temporal bone, in the inner ear, and they monitor position and movement in gravity through an ingenious system of tubes and otoliths.

The Vestibular System, however, is basically a nervous network connecting the parts of the Central Nervous System (CNS) that comprise the Autonomic Nervous System (ANS) with sensory and higher centres. This system keeps us upright while still, and prevents us falling while in motion. These connect to the motor reticular formation, which is a diffuse network of motor pathways in the brain stem connecting the spinal cord, cerebrum and cerebellum. There are also direct connections to the thalamus and hypothalamus which are involved in autonomic regulation. All in all we are looking at the system or network directing the ANS.

To achieve optimum functioning efficiency of the body, the ANS must maintain a stable internal environment. This is done through its Homeostatic function at whose heart is the hypothalamus with its physical location just above the pituitary gland, almost exactly in the physical centre of the cranium.

Homeostasis

The function of Homeostasis is essential to the understanding of what we call Stress. Professor Hans Selye coined the term in the 1930s and wrote many books on the subject. In essence he wrote that when external or internal forces challenge the body system, especially the physiology, (he called it strain), the homeostatic part of the Vestibular System attempts to restore optimum conditions by means of a continuous negative feedback loop. It acts through a complex system of responses via the chemical and nervous systems to reduce the original effect of the stimulus, attempting to return the variable back to its original state. The body's Capacity to return to balance depends on the amount of energy available.

However, should the strain exceed the body's Capacity to restore equilibrium, this feedback mechanism becomes so overloaded that it switches to a positive feedback mechanism. The strain turns into Stress and instead of restoring the equilibrium, the body is sent further out of balance. The Homeostatic system still operates, but is now maintaining a positive feedback loop which further lowers the capacity and drains energy. It's a vicious circle, which Selye calls the **General Adaptive Syndrome.**

It is usually through outside intervention that the positive feedback loop can be broken either by releasing the stress in the body, or by providing more energy until Capacity is restored, or both. When Capacity is restored, balance can be restored and self-healing can take place. Most therapies work on this basis. There is also another, ancient method and that is the practice of meditation.

Unfortunately there appears to be a catch. During its attempt to maintain function, the homeostatic mechanism reprogrammes Pattern Generators in the ANS. However in changing the homeostatic patterns, adapted function starts to feel normal. When a correction is made to our now adapted function, even if it is returning to equilibrium, it will feel uncomfortable and often painful. So without repeated practice and persistence, the patterns do not change, despite using a lot of energy to maintain this imbalanced status quo. All this can prevent or delay healing. It is here that the Alexander Technique is so valuable as it directly targets this problem. Although there is much written about the anatomy and physiology of the Vestibular System, there is very little mention about its own capacity to function and self-correct. What is almost always left out of the picture is the mobility of the temporal bones, which must be free to adapt and self balance. If the temporal bones are out of balance and/or fixed, the influence on the functioning of the ANS, and thus the physiology of the whole body, can be profound. As an example, tinnitus ivs just the tip of the iceberg.

Looking at it from the point of view of dentistry, the main influence on the stability of the temporal bones is the mandible. It is an unusual bone as it is the only bone in the body that functions across the midline

and has not one but two synovial joints at each end, separated by a fibrous articular disc enabling the condyles to glide and rotate at the same time. The bone itself can then adapt to perform its essential functions in so many activities around the face and mouth. However looking at it from the cranial point of view it can also be seen as a protector and balancer of the temporal bones which are themselves moved by the Primary Respiratory Mechanism. When the cranio-mandibular system runs out of capacity to adapt, various serious symptoms can appear anywhere in the psychophysical body because of its effect on the ANS.

In practical terms, when dentists work on any of Moffett's Orders they will inevitably cause adaptation in each and all of them and if they are not aware of the effect they are having on the ANS through the temporal bone, they can leave the patient in a state of stress.

On the other side of the coin, careful work on restoring the occlusal joint (One) through restoration and orthodontics, restoring the health of periodontal membranes, and freeing and balancing the action of the TMJs will allow the temporal bones to free and balance, increasing the capacity of the Homeostatic/ ANS to remove (dis)stress. Many of the miraculous cures that dentists report when working with the TMJs can be attributed to the effect on the temporal bones.

Standing the coin on its edge, it can be seen that cranial work would also have a balancing effect on the Orders through the temporal bone by increasing the capacity for healing or preventing problems that conventionally would be dealt with by dentistry.

If I can offer one piece of advice, it is to recommend that the optimum start of every treatment (and for dentists at the end) is to free the temporal bones. There is a sure-fire way of doing this. With the patient lying down to reduce gravity, place something resilient such as a pencil or a cotton wool roll between the front teeth exactly in the middle, monitor the temporal bones and wait. Sooner or later (and this can take anything from a few minutes to half an hour) the bones will unwind and free as much as they are able to. Your work will then have the aid of the Vestibular System and the ANS, and in dentistry, will remove the stress of dental trauma.

This brief article has hopefully raised more questions than provided answers. Much has been implied or mentioned somewhat briefly, and perhaps too many technical terms used, but these things can be found in abundance should there be any interest in pursuing this subject further.

Summary

In the biomechanics/biodynamics of the human body the way modern dentistry works with the craniofacial articulations influences the Vestibular System and thus the CNS via its effect on the temporal bones. In the same way, CST with its effect on the temporal bones, can affect the craniofacial articulations potentially leading to the prevention or cure of many dental problems. However we would still need dentists to deal with trauma, wear and restoration of the masticatory apparatus.

Wojciech Tarnowski

Interesting reading:

Belli, Richard. A BRIEF DISCUSSION OF CRANIAL MANIPULATION AND VISCERAL AND SOMATIC RESPONSE. (Pdf sourced on the Web)

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