

PHYSIOLOGICAL DEFORMITY AND BIOMECHANICS

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INTRODUCTION

Physiological deformity, namely facial as well as postural, is based on a time-dependent transformation of skeleton with time due to gravitational energy. In fact, the human body is built up with various visceral as well as somato organs and a mechanical skeletal supportive system. In large sized animals, there are five major correlations between organs and skeletal structures:

- 1) The central nervous system: a correlation between the cellular membranous system of the endo- and ecto-derm and the muscular system;
- 2) The autonomous nervous system: a correlation between the ectoderm and the visceral systems as well as somato organs by capillaries;
- 3) The medium system: hormones and cytokines in the blood and lymphoid system;
- 4) The cellular respiration system: a correlation between intracellular mitochondria and other cells through a physiological medium;
- 5) The biomechanical energy system: due to the influence of the gravity force of the earth and even of the moon.

Human body morphology is controlled through these five systems. Here the author examines definitively only the biomechanical aspects.

Concerning the human body, major biomechanical stimuli affecting the structure of the face and vertebrae, including also iliac bone as well as the legs and arms, are categorized by three major habitual behaviors, *i.e.*, mouth breathing, unilateral mastication, and lateral or lay-on stomach sleeping habits. These three behaviors give rise to a chain reaction not only to each other, but also involving head, hands, shoulders *i.e.* to resting one's head in one's hands and shoulder handbag habits. Through these complicated habitual behaviors, the skeletal morphology of the human body gradually changes by the gravitational action of the earth.

Traditionally, in life sciences, energy has been overlooked. Therefore, major causes of not only physiological deformity, but chronic fatigue syndrome and immune diseases, are also overlooked. Life is the remodeling system of a part or the whole cell or organism in conjugation with energy metabolism, upon which various kinds of external energies have an influence, for example, the radiant energy of the sun and the various energetic forms that flow from earth and moon, and, in some extent, even from the constitutional parts of the galaxy. Facial and postural deformity occur under the influence of various kinds of energy, as far as gravitational one has to be considered the strongest in having influence.

What is gravitational energy?

Quintessentially, the cosmos comprises space, time, substances characterized by the mass, and various kinds of forces: gravitational, magnetic, electric, *etc.*, and natural laws that govern them such as in the ambit of thermodynamics.

Gravitational force exclusively belong to and act on substances with mass and does not exercise action in the ambit pertaining to electro-magnetic forces.

The energy produced by the action of the different forces on the categorical entities of their specific pertinence is produced with time and acts according to its quantity. On the other hand, the behavior of solid substances at thermodynamic equilibrium is not time dependent, unless they take on energy from the surrounding environment, so losing their thermodynamic equilibrium to reach another one.

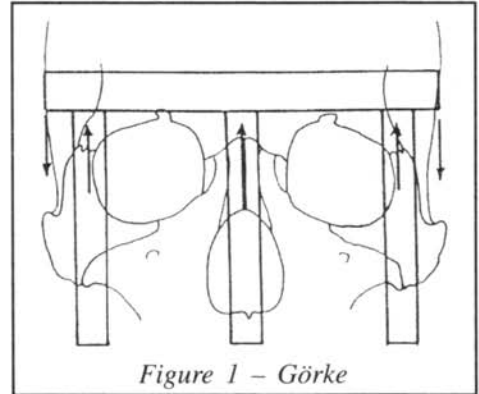
Substances with mass have three kinds of states: solid, liquid and gaseous. The substances, characterized by a mass, undergo (physical and/or chemical) modifications with a certain rate when they receive or loss thermal energy. This rate depends on that with which energy is exchanged and from the necessary time of structural relaxation during the transition time from the starting to the arrival equilibrium times. The molecules of which the substances are constituted move, more or less rapidly, all around their reached thermodynamic equilibrium state. In the case of release of energy, a lowest asymptotic limit exists of the thermodynamic equilibrium (obviously not reachable being an asymptote) that is placed at: -273.13°C (absolute zero).

Connection between gravity and body morphology

Letting us go back to the question of the gravity influence, it has to be remarked that all organisms are constructed with water-soluble colloids of organic substances, even in the skeletal osseous tissue. Looking with attention, effectively gravitational force acts in an important way in the shape of the substances at their liquid state. This is more marked with tissotropic elastoplastic colloids, like those that compose the living body tissues.

Famous historical studies of facial morphology have been carried out by many researchers. The scheme of constructive biomechanics is presented here of the most important experts of the past.

- 1) Görke (1904) Figure 1 [1]
- 2) Richter (1920) Figure 2 [2]
- 3) Benninghoff (1925) Figure 3 [3]
- 4) Bluntschli (1926) Figure 4 [4]
- 5) Sicher and Tandler (1928) Figure 5 [5]
- 6) Endo (1966) Figure 6 [6]



There are also famous histological studies of skeletal shapes known as Law of Julius Wolff (1836-1902) on the functional adaptation of bone morphology. However, this law is restricted to very narrow conditions and over use of the constant bias function results in discrepancies of shape and function.

Famous clinical examples are temporomandibular joint dysfunctions by unilateral mastication and knee and hip joint disorders (as it was the case of marathoners from poor running posture habits).

Jean-Baptiste Lamarck (1784-1829) proposed in 1809 the "Use and Disuse" theory for animal evolution [7]. Wolff's Law is a part of Lamarck's theory instructed only by skeletal morphology within one generation [8]. Lamarck's theory has important limiting conditions of use, namely not to go beyond growth and welfare conditions.

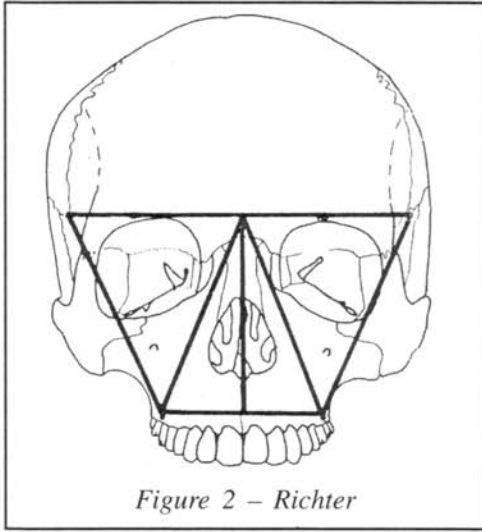


Figure 2 – Richter

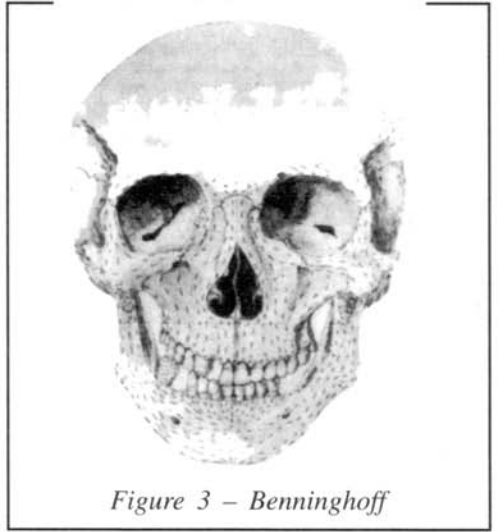


Figure 3 – Benninghoff

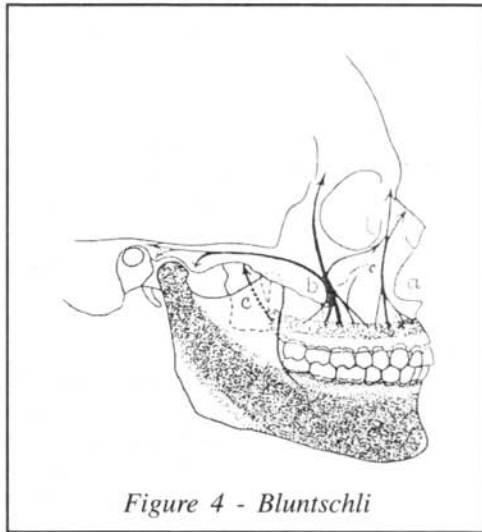


Figure 4 - Bluntschli

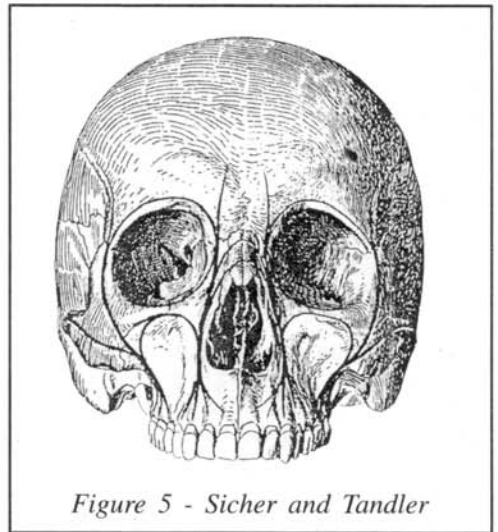


Figure 5 - Sicher and Tandler

If animals use organs or skeletal systems beyond their limits, functional disorders occur. Morphologies induce deformities and those of metabolism induce immune diseases. Applying Wolff's Law to the maxillo-mandibular bone, the functional side shrinks and the jaw without chewing movement becomes slack (loose). Conventionally, Wolff's Law was interpreted into the "Maximum-Minimum" Law of bone architecture by Wilhelm Roux (1850-1950). Roux's Law has been interpreted into the Law of Uniform Strength by Banri Endo [6]. In this law, the functional side becomes larger than the nonfunctional side. Therefore, this interpretation is mistaken in its research premise. Another problem of conventional research on Wolff's Law is the lack of energy effects.

Mechanical Significance of the Form of Facial Skeleton

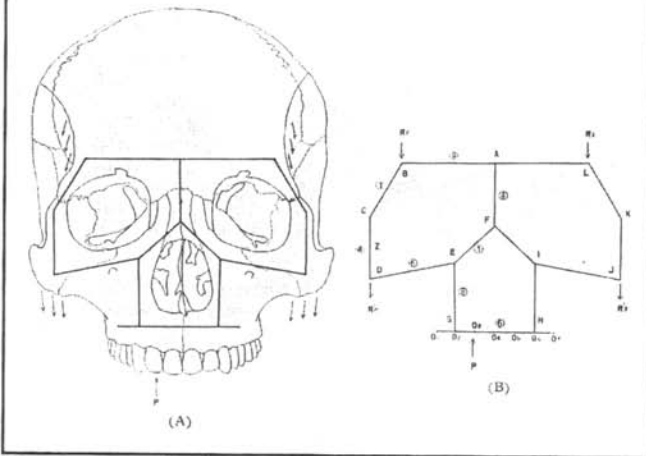


Figure 6 - Endo [6] Abstraction of a model from the frontal view of a human facial skeleton: (A) positions of the members of the model in relation to the facial skeleton; (B) the model with external forces.

Only numerical studies of finite element analyses (FEA) are carried out. However, biomechanical energy does not control bone and muscle remodeling directly. Therefore, research on FEA concerning bone remodeling is imperfect and just half of the story.

The gravity action effect especially upon the mediums of blood or lymphofluids and the biomechanics of the human body are converted into hydrodynamics concomitant to movement. Hydrodynamics induce streaming potential and, by this, bone morphogenetic proteins (BMP) are induced, and these mesenchymal cells differentiate into osteoclasts, osteoblasts and myoblasts, as well as hemopoietic cells.

By these mechanisms, bone remodeling takes place and deformities occur as a result of unilateral, improper gravitational action.

Only humans can breathe through the mouth.

Only humans can breath through the mouth. From this functional fault, human-specific deterioration of the face takes place and human characteristic intractable immune diseases occur. The mouth breathing habit began with the ability to speak, some 6 million years ago. This mechanism was explained by Lamarck's Use and Disuse theory of transformation of the construction and morphology of the tongue, throat and oral cavity. The second cause of deformity is brought about by unilateral mastication. This habit is acquired by raising neonatal babies and infants. The definition of mammals is "animal, born with the suckling system which later on changes into the mastication apparatus. Suckling and masticatory muscles are derived from the branchial respiratory gut's smooth muscles" [9, 10].

Therefore human infants suckle and adults masticate with respiratory muscles. This is most important for mammals. Humans, eat and suckle during respiration as well as respire during eating and suckling. The failure of orthodox suckling leads infants to adopt the unilateral mastication habit. In addition, too early feeding of foods by infants, especially proteins, lead infants later on to grow up with atopic dermatitis, autism, epilepsy, and food anaphylaxis. The unilateral mastication habit chain reacts with sleeping posture habits.

Laying on the stomach and the lateral sleeping posture cannot be corrected easily. Also, both sleeping posture habits lead to nostril closure by congestion; therefore, the mouth breathing habit begins as a chain reaction.

As a result of these incorrect sleeping postures, skeletal deformities, namely hunchback and lateral scoliosis, pelvic bone deformity, knee dysfunction and arm tenovaginitis as well as facial deformities occur.

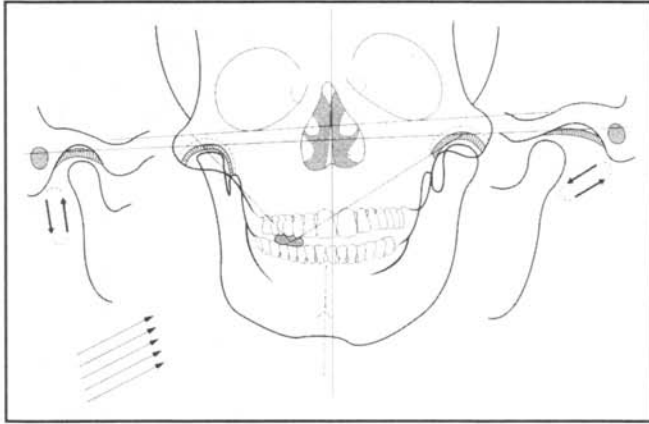


Figure 7 - Functional side (right) become shrinks. Deformity develops by right-side unilateral mastication habit [9, 10].

Facial deformity is led by unilateral mastication, a habit which makes the facial shape asymmetric (Figure 7), and, chain reacts with the lateral sleeping posture habit (Figure 8), thereby causing lateral scoliosis (Figure 9). All of the above-mentioned major behavior habits impact facial as well as body skeletal deformity.

Facial and body deformities take place concomitantly by these complicated chain reactive habits. Therefore, orthopedic treatment and exercises have to be integrated with the entire body.

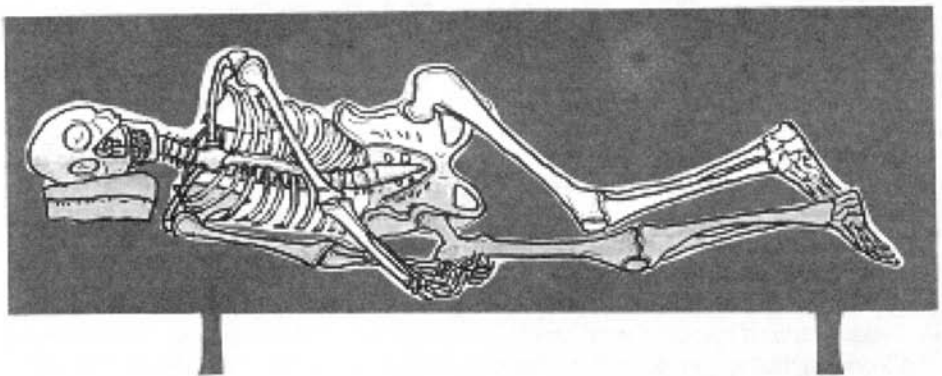


Figure 8 - Unilateral mastication (right-side) chain reacts with right-side sleeping posture [9, 10].

Orthodontic treatment has to be executed with the integrated cure of these habitual behaviors.

Unilateral energy and different movements of temporomandibular joints result in different moving shapes of mandibular chondyles. Ultimately, joints without function are created. This habit chain reacts with the unilateral sleeping posture habit, and from this, the facial skeleton as well as the tooth arch suffer distortion. Because of the human's heavy head (weighing some 5000g), a tooth or a part of a zygomatic bone can be subjected to 70~200g, or 2~10 times more than the normal force for orthodontic use. From this research on human health maintenance, the following are critically important:

- 1) Always breathe through the nostrils, never through the mouth;
- 2) Masticate using both sides the mouth 30~40 times;
- 3) Never drink cold water or eat ice cream;
- 4) Always sleep on your back;
- 5) Use down-soft pillow.

At the initial stage of human evolution, Pitecus (man-like ape) by learning to sleep on their back evolved into Tropus (Archeo-man), which learned to stand upright (biped) as well as speak. If we ever forget correct health maintenance, physical deformities as well as human characteristic intractable immune diseases will be waiting for us.

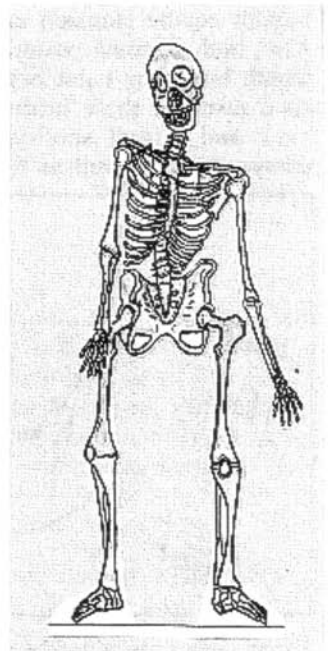


Figure 9 - Standing posture of a person with trilateral habits [9, 10].

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