Frozen Shoulder

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Horizontal® Therapy and Shoulder Treatment

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Treatment of painful diseases of the shoulder and its surrounding tissues as Humeroscapular Periarthritis* (for example frozen shoulder, shoulder pain in hemiplegic patients) and painful joint diseases as Osteoarthritis

Summary

Horizontal® Therapy is based on the fact that bioelectric changes in living tissues are strictly combined with biochemical changes and vise versa. Cells are electrical and biochemical in nature and act by combining these two fields to produce an effect. Based on the natural interdependence of these two characteristics in living tissues, it is belaieved that developing a therapy form that combines both bioelectric and biochemical effects simultaneously would prove to be a more effective communicator to the cell (Function Imitation Principle).

By concurrently acting on both bioelectric and biochemical levels within the cell, Horizontal® Therapy dramatically increases the mimicking effect and therefore produces an improved treatment result, particularly with pain and in many cases of chronic pain where treatment is difficult.

Horizontal® Therapy is able to create action potentials in the biological (low frequency) range from >0 Hz to 200 Hz to influence the electrical side of cells with a constant intensity (amplitude). Traditional stimulators, including TENS, interferential and all low frequency currents, trigger action potentials in the low frequency range as well, but only by increasing and decreasing the intensity (amplitude) in a low frequency rhythm.

Biochemical effects are achieved within a range of 1.000 to 100.000 Hz, using a constant intensity (amplitude) and can be defined as effects achieved without producing action potentials.

Traditional electrotherapy has reached a limit in their efficacy, because they are unable to act on both classes at these levels (bioelectric and biochemical) simultaneously.

Horizontal® Therapy is able to achieve this objective through frequency modulation. By holding intensity constant and changing the frequency in the "biochemical" range, Horizontal Therapy moves back and forth across the Stimulation Threshold and produces both classes of effects simultaneously (Figure 1)

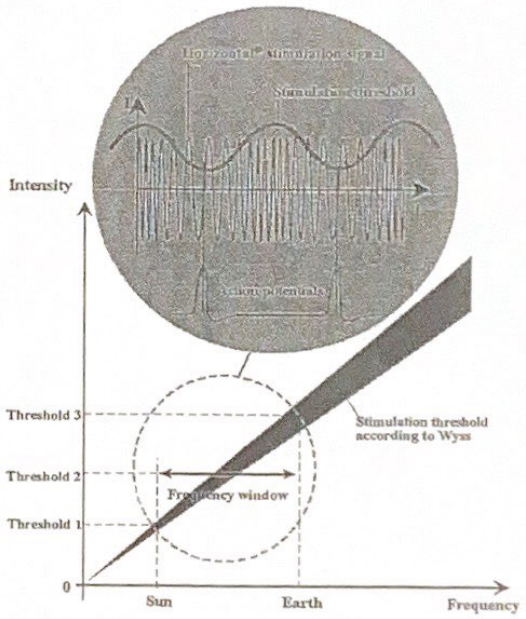


Figure 1 – Horizontal® Therapy, the bio-chemical field

The physical mechanisms of the Horizontal® Therapy are:

1. The "shaking" effects upon freely movable particles (ions and molecules).

   The "shaking" effect equilibrates the differences in concentration. By this the mediators of inflammation and pain (including H+) are distributed and diluted. Because of these physical mechanisms, we found peripheral pain relief and anti-inflammatory effects in all cases of chronic inflammations and acute non-infectious inflammations.

   The "shaking" effect also accelerates the supply with nutrients and accelerates the elimination of the end products of the metabolism from the tissue.

   The "shaking" effect accelerates the diffusion processes and increases the probability of encounters between enzymes and substrates. This mechanism supports the metabolism.

   The "shaking" effect increases the average of the kinetic energy of charged molecules involved in enzyme-mediated metabolic process. This reduces the average of the distance to the activation energy, which the molecule requires for the concerning biochemical reaction.

   As a result the concerning biochemical reaction is facilitated and the turnover of the enzyme(s) is increased.

2. The "rotary" effects upon freely movable particles (ions and molecules).

   The "rotary" effect upon water molecules as dipoles causes destabilization of the clusters of the water molecules. The "rotary" effect increases the property of the water as a solvent.

   The "rotary" effect facilitates the metabolism because it increases the probability of encounters between enzymes and substrates in the correct position to each other.

3. The "oscillation" effects upon not freely movable particles (molecules).

   The oscillation effect upon not freely movable structures means, that oppositely charged different parts of the molecules move simultaneously in opposite direction.
   The oscillation effect increases the movements of fluids (water and in water dissolved or immersed substances) between the oscillating structures.

   The oscillation of not freely movable structures has the following therapeutic effects:

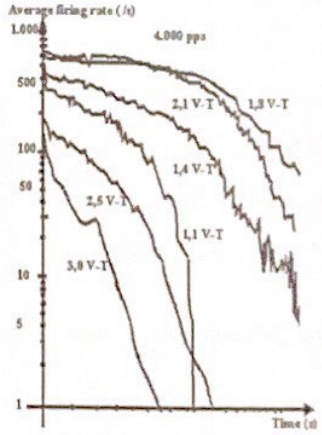
   - Tissue cleansing,
   - facilitation of the metabolism,
   - pain relieve and
   - edema reduction.

4. The "oscillating deforming" effect upon signal molecules and macromolecules.

   The "oscillation deformation" generates conformation changes of macromolecules including signal molecules. This activates special enzymes. We can expect - for instance in the cell membrane - the activation of the adenylate cyclase followed by a formation of the second messenger cAMP (cyclic adenosine monophosphate).

The "shaking", "rotary" and "oscillation" effects of the Horizontal® Therapy are using the electrical field strength of the alternating electromagnetic field in the frequency range between 2.000 Hz and 100.000 Hz

Single fiber average firing rate due to blocking signal of 4.000 pps and various amplitudes - distal electrode position
Bruce R. Bowman, 1981



Triggering APs by the mechanism of "tea": transient excitatory activity

Figure 2 – Horizontal® Therapy, transient excitatory activity ("tea")

"tea" is a special electro-physiological effect of the Horizontal® Therapy, which is created in the SCAN technique.

The transient excitatory activity generates a fading tingling sensation in the areas innervated by the affected sensory nerves. An asynchronous firing in the afferent nerves causes this sensation. As a result of "tea" a very intensive counter irritation occurs which leads to central pain relief.

The Horizontal® treatment concept has the following therapeutic effects which are important for the shoulder treatment (soft tissue and joints):

1. According to the distribution and the thinning of pain mediators including the mediators of inflammation.
2. Facilitatory effect upon metabolic disturbances within the treated area, especially by means of normalizing effects upon the tropism of the affected tissues.
3. As a result of "tea" in afferent sensory fibers by means of counter-irritation a central pain relieving effect.
4. As a result of "tea" in efferent sympathetic nerve fibers initially a vasoconstriction in the innervated area, but after latency as a result of "phd" (post hyperactivity depression) vasodilatatory and pain relieving effects.
5. Because of physiological contractures of the smooth muscles of the vasculature of the blood and lymphatic vessels an anti-edematous effect, reducing additionally pain, if the edema is involved in the pain generation.
6. As a result of periodical physiological muscle contractures or periodical physiological tetanic muscle contractions various metabolic effects and effects of the regional blood flow:
   a. prevention of disuse atrophy,
   b. increase of the regional blood flow,
   c. anti-edematous effects
7. Because of efferent sympathetic nerve stimulation, a vasoconstrictory effect occurs during the stimulation.
8. Because of efferent sympathetic nerve stimulation, according to the function-fatiguing principle, after an initial vasoconstrictory effect a longer lasting vasodilatation occurs.

The most important effects in cases of Osteoarthritis are:

1. The facilitatory effects upon the metabolism
2. Facilitation of diffusion processes between the blood vessels within the capsule of the joint through the abnormal thickened tissue of the capsule to the lining synovial cells and through the synovial fluid and the extra cellular matrix of the cartilage to the chondrocytes,
3. The peripheral pain and inflammation relieving effects (distribution and thinning of the mediators of pain and inflammation).

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*The term "Humeroscapular Periarthritis" is a collective name for different diagnoses: Tendopathies (for example of the supraspinatus muscle), biceps longus syndrome, biceps brevis syndrome, acute inflammations in the surrounding areas of paratendineous calcifications, different types of bursitis, for instance subacromial bursitis, frozen shoulder (for example in hemiplegic patients or in cases of post-traumatic or post-surgical immobilization. The common properties of all these pathogenically different conditions are pathological changes within the periarticular soft tissues.