

## **Galvanotherapy, modification, dosage, indications and contraindications**

Galvanotherapy is a special type of monophasic current with uninterrupted, unidirectional flow of electrons toward the positive pole. Effects are:

- On the electrodes and in their close proximity by accumulation of products of electrolyte dissociation
- In the electrode pads by change of ion concentration, electrolytic dissociation and iontophoretic incorporation of ions
- In the current path by polarization of tissues, changes in the tissue resistance, hyperaemia, affecting of the nerve irritation, effect on the thrombus and affecting of the muscle excitability

Galvanotherapy is a part of the base current in diadynamic currents.

Polarization of tissues change the concentration of ions in the extracellular environment. Prolonged application > progressive membrane depolarization > gradual decrease of resistance > after 30 minutes there is a balance between the polarization and diffusion of ions > after finishing the application the original state is restored

Galvanization also causes hyperemia by releasing precapillary sphincters across the current path. Steady state between hyperemia and polarization at a current density 0,1 ma cm<sup>2</sup> is reached within 30 minutes. Positive step for chronic and subchronic state is 5 minutes up to 40-60 minutes.

Methods of application are transregional, longitudinal, paravertebral, radicular, gangliotrophy (less frequent method of application) and neural. Indications for neural application are mononeuritis, localized neuralgia, phantom pain and dysesthesia

Other variations are four-chamber galvanization, electrotherapy bath, ion bath face for trigeminal neuralgia and iontophoresis.

Iontophoresis is incorporation of ions or electrically charged organic molecules into the skin. It uses one of the fundamental electrical phenomena- repulsion of like-charged parts. Electrode with pad soaked in a solution is active and the other is indifferent.

Effects:

Local improve metabolism and tissue regeneration

Improve the local cellular and non-cellular immunity

Reduce the pain of local ischemia

Chronic release of local muscle spasms

Affecting of the nerve irritation by anelectronus effect:

- The positive electrode attracts anions from the surface of the membrane of a nerve fiber
- This will increase the membrane potential at 80 MV and leads to hyperpolarization.
- This has the effect of reducing irritation- hypalgesia

Affecting of the nerve irritation by catelectronus:

- Negative cathode attracts cations from the surface of the membrane of a nerve fiber
- This reduces the membrane potential at -60 MV and there is partial depolarization
- This increases the excitability- toning
- After some time, however, decreases irritation- cathodic depression
- When high intensity is even a cathode block

### **15.2 Mid-frequency electrotherapy: different types, indications and contraindications, basic parameters**

Basic characteristics of mid-frequency electrotherapy is that the area of treatment is deeper tissue. The use of four electrodes also gives a moving current, either with two rotating vectors or a bigger field of electricity with differences in amplitude depending on placement of electrode. Because of this reason, the therapist must have a detailed knowledge of anatomy and the exact localization of the injury, unless we use the isoplanar vector field.

Medium frequency- current are also called interference currents, and have a frequency of 1000-100 000 Hz. They work in a way that two currents interact when we apply four electrodes, and the interfeention creates a deeper penetration by that the two currents cross, and the difference of the currents is the effective dosage deeper in the tissue equaling low-frequency. Types used are quad-polar, bi-polar interference, isoplanar vector field and di-polar vector field. Quad-polar interference use two circuits with principal current between 4000 and 8000 hz and vector summation produce final low frequency current. Bi-polar interference is an exception with only 1 channel where mix of two channels occurs in generator instead of tissue. It does not penetrate tissues as deeply but is more accurate. Isoplanar vector field is the most common, because it got 100 percent modulation in the entire treating area, so it needs less precision and is gentle for acute patients. Di-polar vector field is a mix of two channels that occurs in generator instead of tissue. It has 100 percent amplitude modulation in one direction and zero in the other. It can rotate and it is possible to adjust the velocity of rotation on the machine.

Indications are muscles with trigger points, relaxing muscle spasms, hemocirculation malfunction, preventing or slowing tissue atrophy due to disuse, increasing blood circulation, re-educating muscles to avoid unfortunate movement patterns and maintaining or increasing ROM.

Contraindications are fever, cachexia, pacemaker, metal implants, pain of central origin, pain of unknown origin, venous inflammations, epilepsy, skin injuries, cancer, and placement on sinus carotidis.

Modulations we can use are frequency modulation and amplitude modulation. In acute patients we make frequency modulation by 15-20 hz, while in chronic patients we make frequency modulation of 30-60 hz.

### **Physical therapy in neurology**

Neurological damage can result in the disruption of normal physical, psychological, cognitive and social functions, which reinforces the need for a collaborative and co-ordinated approach from a wide range of rehabilitation professionals.

Neurological damages can be stroke, multiple sclerosis, motor neurone disease and traumatic brain injury. It can be a challenge to communicate with these patients as they may have speech disorders.

Signs and deficits in stroke are motor, visual, perceptual, sensory, communication and swallowing.

Multiple sclerosis can be difficult, because 45 percent suffer a type which is called relapse-remitting, which is significantly worse in periods, or it can have a character of steady deterioration.

Motor neurone disease, MND, is characterised by progressive degeneration of motor neurones:

Anterior horn cells in the spinal cord, resulting in lower motor neurone lesion LMN, corticospinal tract cells, resulting in upper motor neurone lesions and motor nuclei in the brain stem, resulting in both upper and lower motor lesions.

As the condition progresses, and this will vary from person to person, physiotherapy interventions will take the form of exercise programmes and how to best incorporate these into everyday activities. As movement becomes more difficult through weakness or spasticity, passive movements are indicated to prevent secondary impairments of the musculoskeletal system. Active-assisted exercises may be required if the person needs assistance to move.

In physical therapy, treatment approaches for patients with neurological diseases are based on neurophysiological findings. Plasticity is an important characteristic of the nervous system utilized during physical therapy. Even in scenarios with a permanent defect of the nervous system, certain functional reserves and compensation abilities are available and need to be utilized during therapy.

Neuroplasticity can be defined as the ability of the nervous system to change depending on internal or external conditions that are physiological, for example loading or inactivity on the opposite. Also experiences and repeated stimuli like learning and habituation.

Proprioceptive neuromuscular facilitation like Kenny method can be helpful.

Passive movements of limbs are an important part of physiotherapy in neurology, because even though we don't get a movement, there will still be nervous input to the muscle, and maybe even contraction, so that we retrain the muscle and prevent atrophy.

Biofeedback has been identified as an effective technique for treating a variety of neurologic conditions, including hemiplegia following stroke, spinal cord injury, spasticity, cerebral palsy, facial paralysis, and urinary and fecal incontinence.

Biofeedback is a therapeutic procedure that uses electronic or electromechanical instruments to accurately measure, process, and feed back reinforcing information by using auditory or visual signals.