T.E.C.A.R. – ENDODIATHERMY

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01. Tecar: definition

- Diathermy

From the Greek “dià - thermos”

“Through heat”

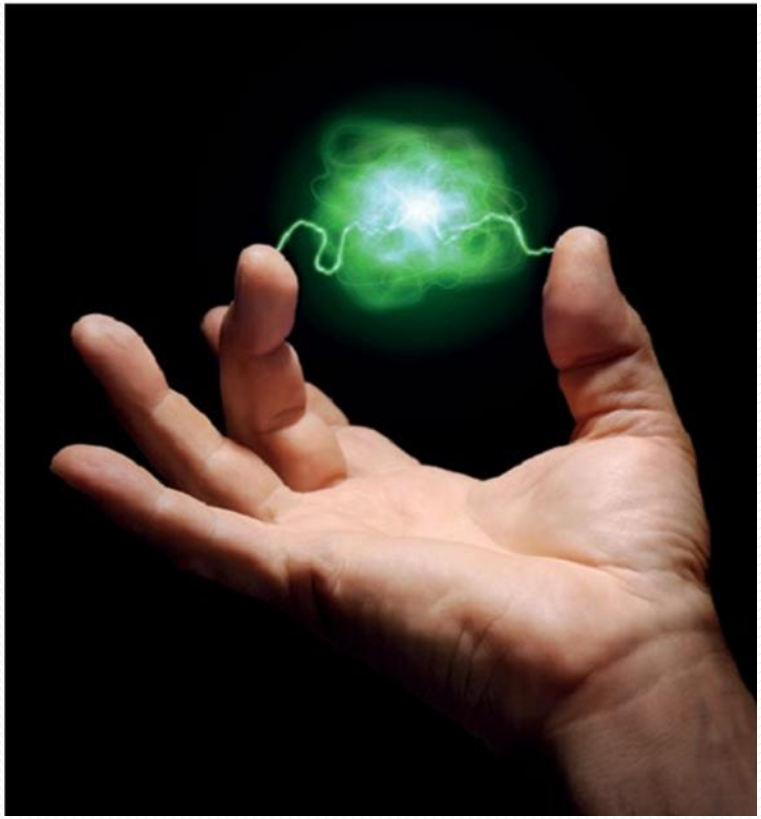
- TECAR

Trasferimento Energetico Capacitivo e Resistivo

- Energetic Transfer

Capacitive and Resistive

01. Tecar: definition



"Heat conduction within tissue"

Using this method the body can be healed using internal energy and natural auto-repair mechanisms found within tissue and muscles.

02. History

1864

J.K. Maxwell

Electromagnetic waves theory

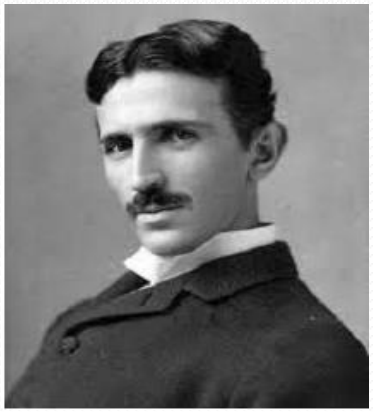
1878

Heinrich Hertz

Proved the existence

of the electromagnetic waves

02. History



1887

Nikola Tesla

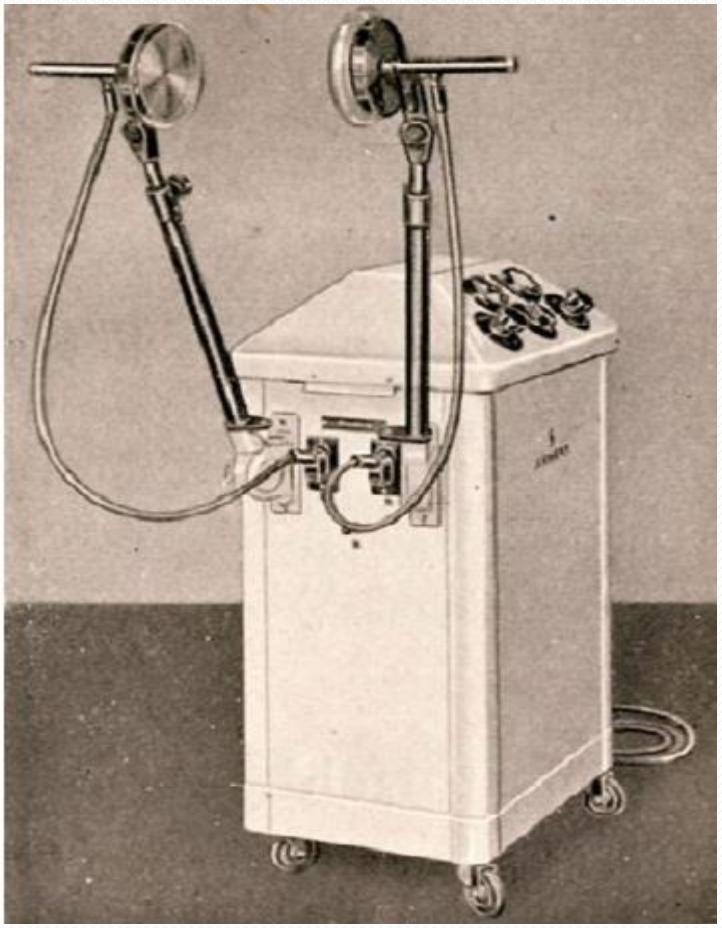
First AC current generator,
high power and high voltage

1890

Doc. Arséne d'Arsanoval

Studies on the effects of high frequency electromagnetic fields on biological tissue.

02. History



1906

Carl Negelschmidt

First prototype

1925

J. W. Shereschewsky

Study on animals

1970

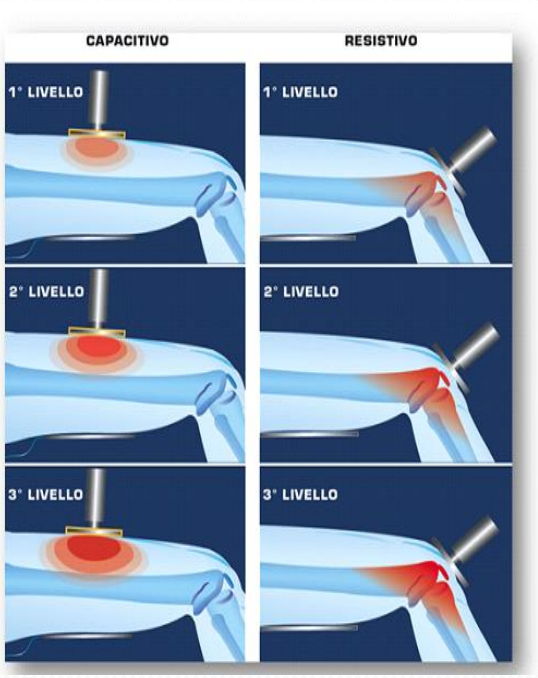
First uses of this therapy

03. Capacitive and Resistive application

- Tecar is a complex electrotherapy machine that emits AC current with frequency between 300 kHz - 1MHz
- Two emission modes:

Capacitive mode

Resistive mode



03. Capacitive and Resistive application

Impedance

It is the measure of the opposition that a circuit presents to a current when a voltage is applied.

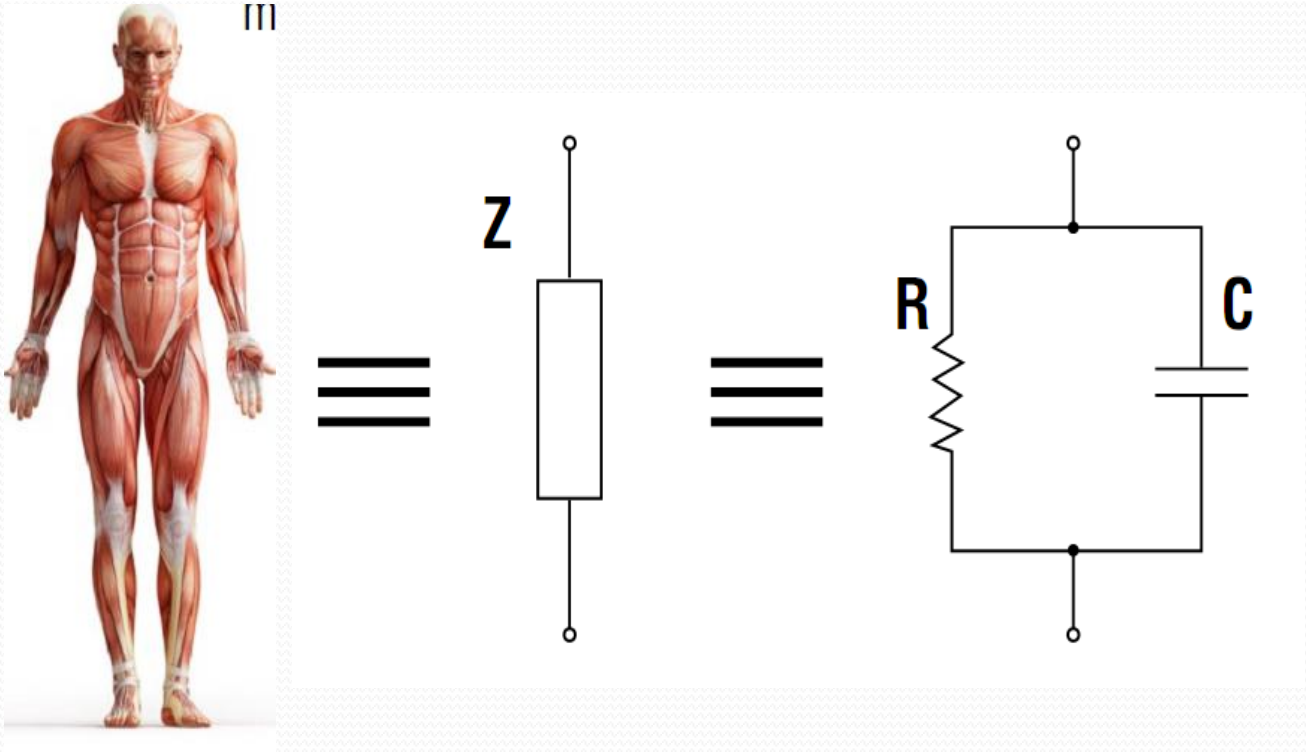
$$Z = R + jx$$

$$x_c = \frac{1}{\omega C} = \frac{1}{2\pi fc} = [\Omega]$$

03. Capacitive and Resistive application

How it works

The human body is the equivalent of an electrical circuit made up of parallel resistor (R) and condenser (C)

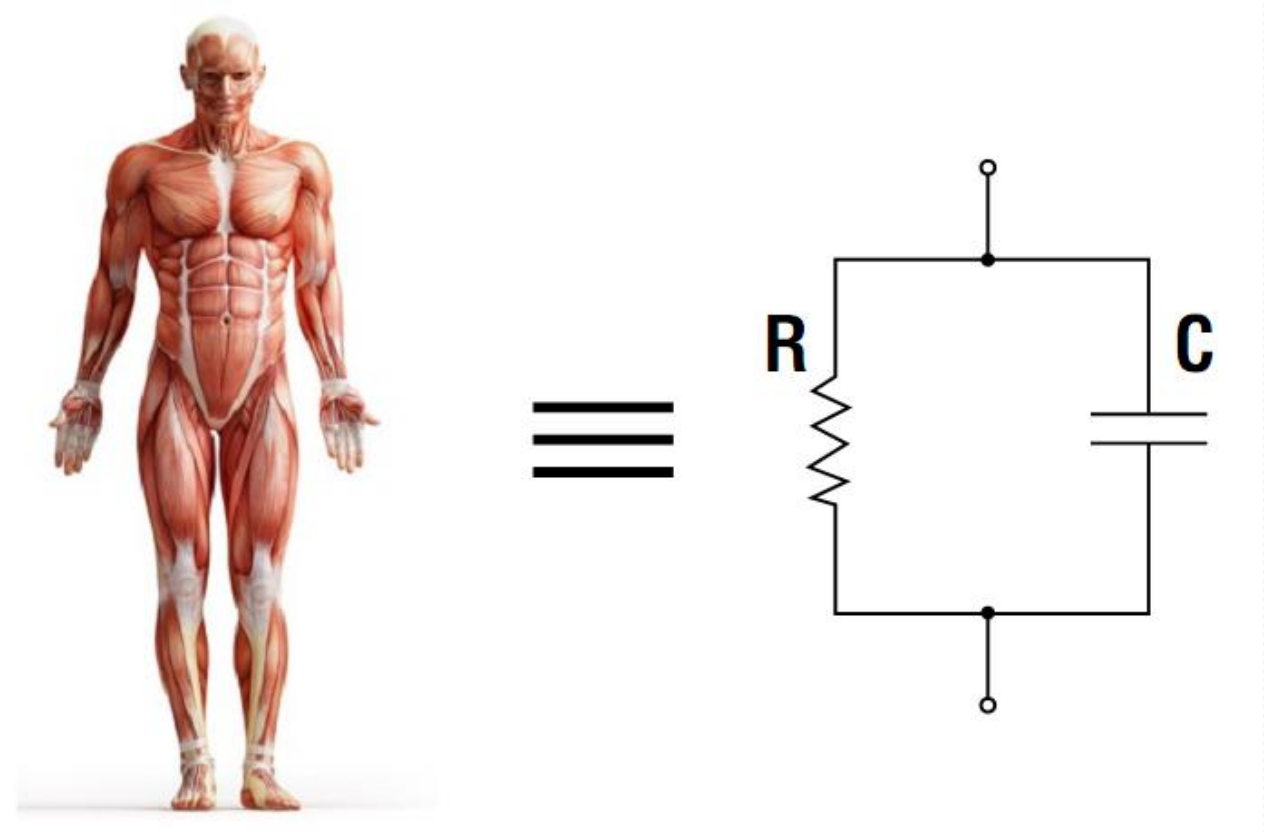


03. Capacitive and Resistive application

The simplified circuit human equivalent

R: bone, cartilage, main tendon

C: muscle mass

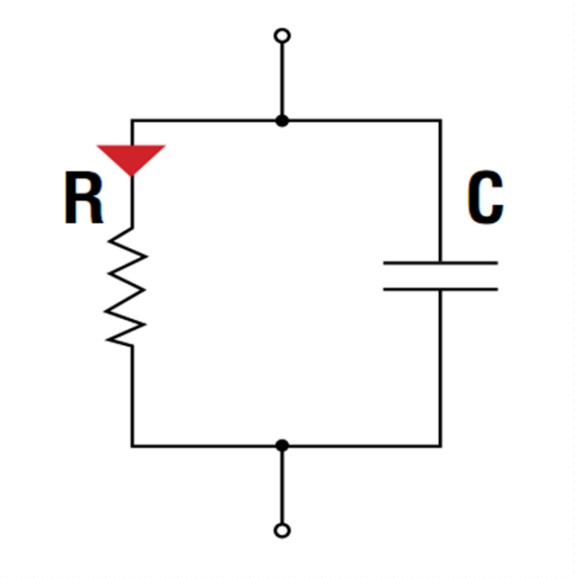


03. Capacitive and Resistive application

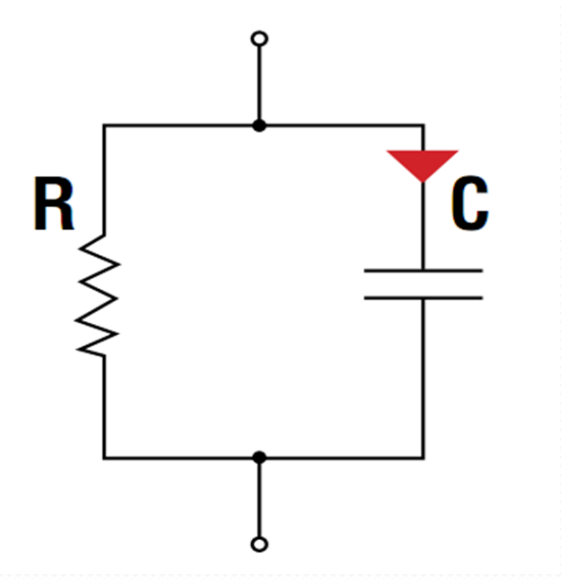
Behavior with diathermic current

The flow of the diathermic current through the resistor and capacitor is a function of the frequency

Behavior at LOW FREQUENCY



Behavior at HIGH FREQUENCY



03. Capacitive and Resistive application

Why?

$$Z = R + jX$$

$$x_c = \frac{1}{\omega C} = \frac{1}{2\pi f c} = [\Omega]$$

F = Frequency (Hz)

03. Capacitive and Resistive application

Why?

The capacitive application depends on the frequency,

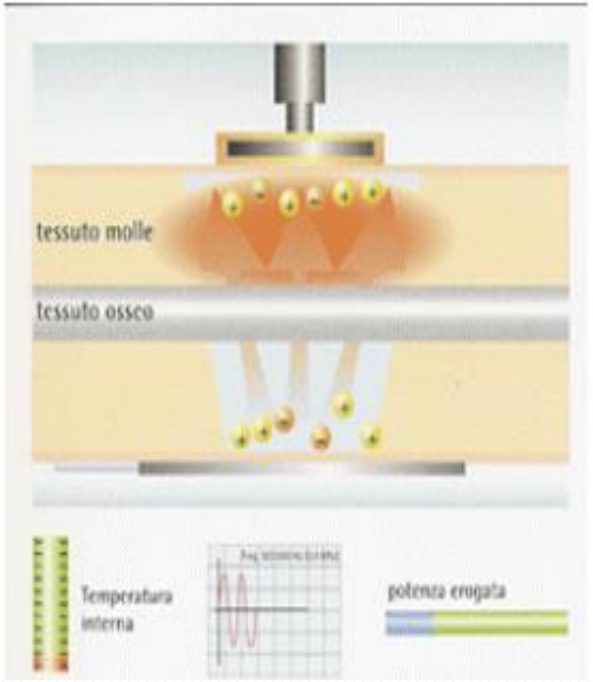
not the insulated plate

The insulated plate is an impedance that heats up depending on the current flow and the material type.

04. How endothermy works

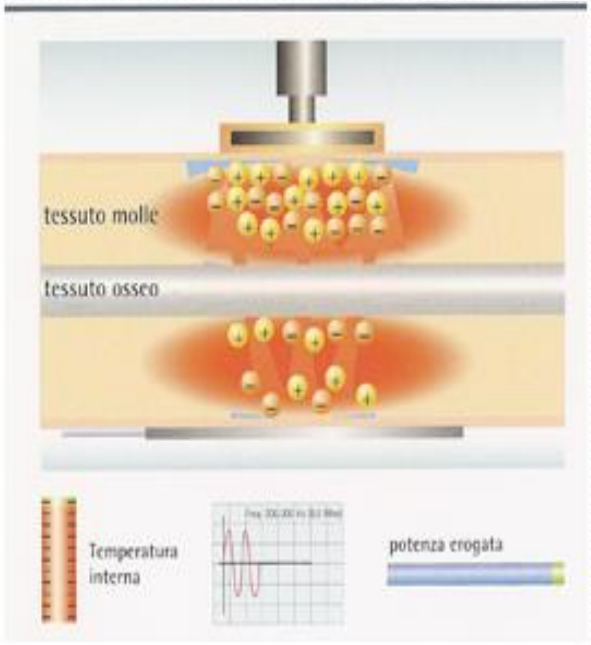
Working on Capacitive mode

The area underneath the mobile electrode by stimulating soft tissues rich in water content, such as derma, the lymphatic system, muscles and the venous system. The diathermic stimulation is obtained by CAPACITIVE mode using isolated electrodes (with different dimensions according to the area to be treated) and a neutral electrode, known as return plate, closing the conductive circuit. There is no current transit between electrodes and tissues, though the latter remain exposed to an intense electromagnetic field. Water molecules and soft tissues, being exposed to this field, tend towards this until they rotate to bring the two opposed polarities near one another. The rhythmic inversion of polarity in the sinusoidal electric current (alternated between + and -) reaching the electrode produces a constant mechanical inversion in the molecules involved in the process, thus causing a movement of ions and free radicals in its turn stimulating the trophic and metabolic functions of soft tissues.



04. How endothermy works

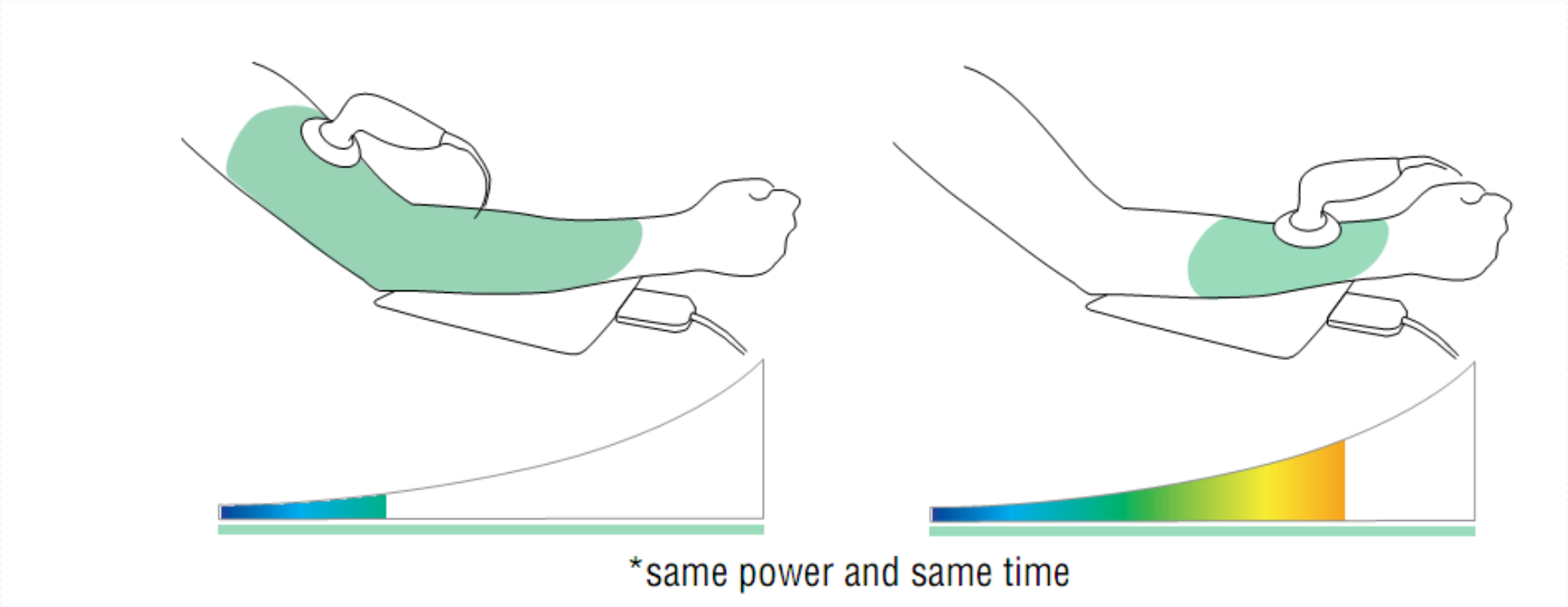
The action is performed efficiently on all high resistance and low water content tissues interposed between the mobile electrode and the return plate, thus obtaining a biological effect on: deep muscles, joints, tendons, ligaments, cartilages, bones. The diathermic stimulation is obtained by RESISTIVE mode using non-isolated electrodes (with different dimensions according to the area to be treated) and a neutral electrode, known as return plate, closing the conductive circuit by acting as a pole; in this case, there is a transfer of current in the tissue between electrodes. A correct positioning is essential if you want to obtain any beneficial effect on the areas to be treated. The heating of the concerned tissues stimulates vasomotory, trophic, local metabolic and systemic effects. The use of this specific mode is necessary due to the different electrical resistance of the tissues and the deepest body parts, such as muscles, tendons, ligaments, cartilages and bones compared with more superficial tissues.



05. main features

Biotransfer

The system detects the energy transferred to biotissues within the anatomical region being treated, as a function of time and delivered power.



Biotransfer displays the variation of electrical impedance during the treatment.

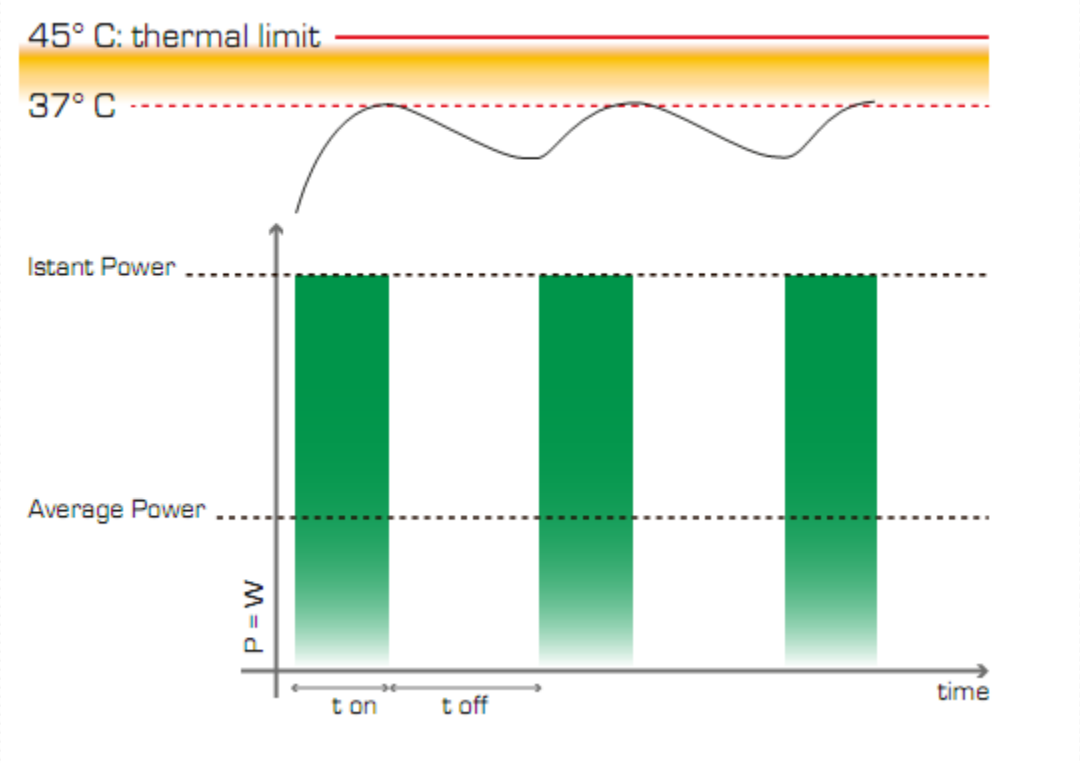
06 . main features

Coupling system

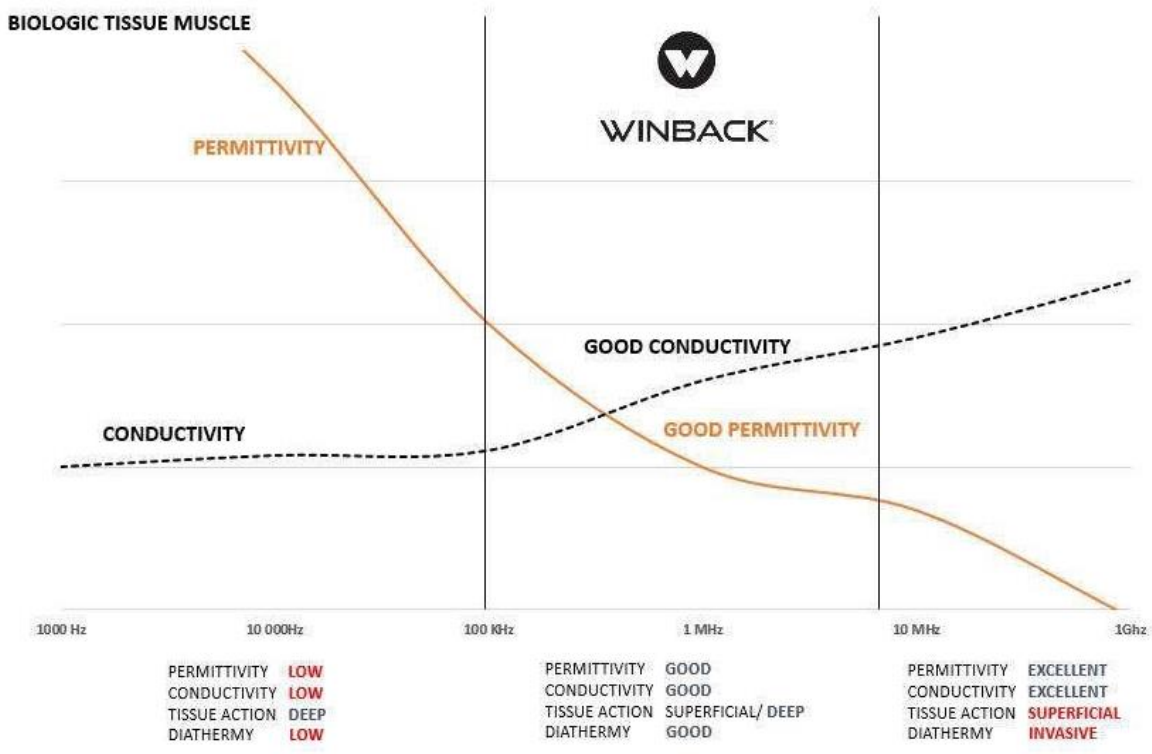
Each patient has specific bioelectric characteristics.
That's why Tecar is fitted with the coupling system, allowing
the operator to set the value that is nearest to the patient's bio sensitivity.

Adjustable pulse mode

In this mode energy is delivered at time intervals which can be adjusted by the operator. Pauses between pulses match the tissue thermal relaxing time.



PERMITTIVITY/ CONDUCTIVITY



C Gabriel « The dielectric properties of Biological tissues»(4)

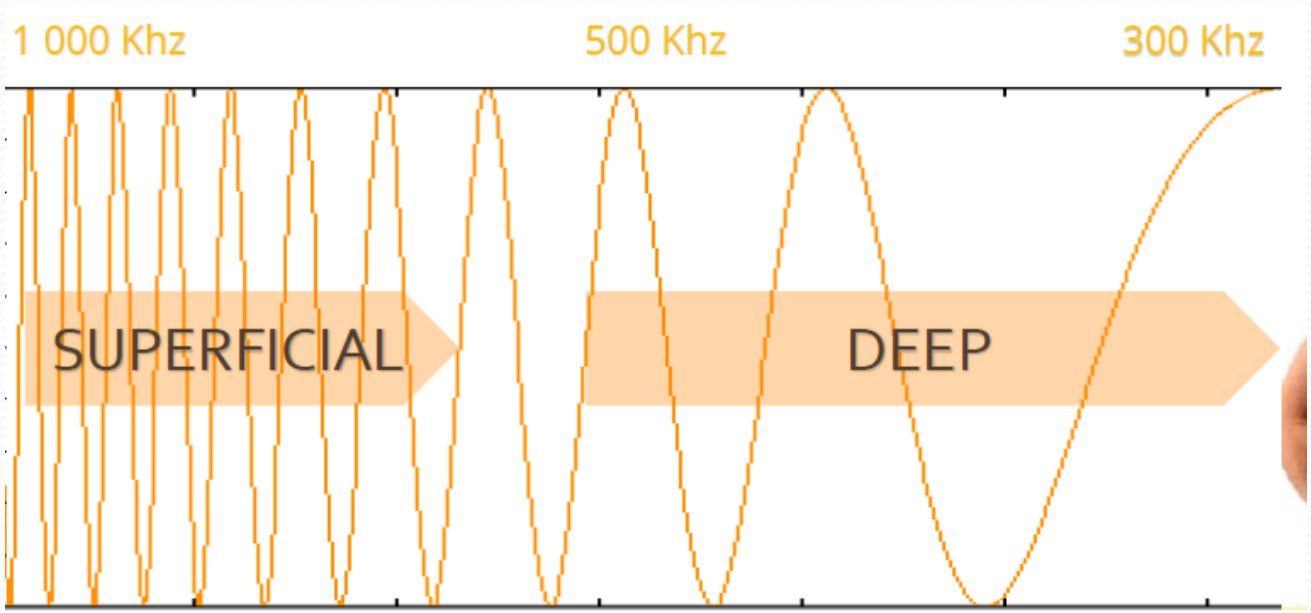
PERMITTIVITY = permeability some tissue

CONDUCTIVITY = Depends on the resistance of the tissue Between 100KHZ and 10 MHZ the cellular polarization does not have time any more to become established in the passage of the energy.

PERMITTIVITY /CONDUCTIVITY, facilitates the exchanges intra and extracellular in a not invasive way.

PRINCIPLE OF THE FREQUENCY

The energy offers various frequencies between 300 KHZ 1 MHZ.



The more the frequency is **HIGH**, the more it is concentric and superficial.

More the frequency is LOW, More it is diffuse and deep.

07.main therapeutic effects

ANALGESIC EFFECT

- The activation of micro-circulation allows the rapid absorption of edema and inflammatory catabolites including algogene substances.

- The direct action on Trigger-points using Tecar promotes fast vascularization of the ischemic tissues and connective tissues.

07.main therapeutic effects

ANTINFLAMMATORY EFFECTS

- Vasodilatation and fast activation of micro-circulation: the effects of Tecar which significantly reduce the concentration of the inflammatory fluids. The effect of Tecar together with drainage action restores the correct metabolic activity.

07.main therapeutic effects

BIOSTIMULATION EFFECT

- Temperature increase:

- Increased blood flow

- Reduction of homeostasis

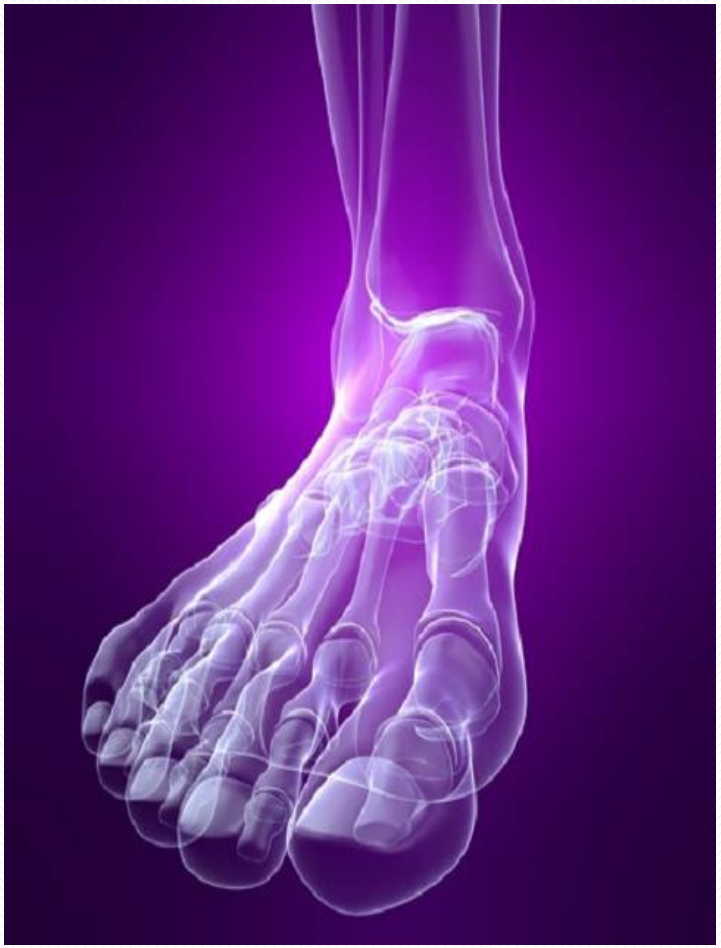
- Activation of lymphatic peristalsis

- Increased electrolyte flow

- Metabolic boost through cellular "hyper-ventilation"

- Re-establish intra and extra cellular electrolytic balance by restoring membrane potential.

Powerful oxygenation by an intense hyperemia through increased tissue temperature.



08. Levels of application intensity

For a better transfer of energy to the tissues on the area to be treated, a saline coupling gel is used or a transmitting gel preventing the interposition of air between the electrode and the body surface and making the irradiator and the skin "stick together". Inside the selected protocol, you can find three levels of application intensity: low, medium and high, depending on which the biological response is differentiated:

POWER	BIOLOGICAL EFFECTS	
	CAPACITIVE TREATMENT	RESISTIVE TREATMENT
LOW (athermic) 50-100 watt	Cellular biostimulation with increase in cellular energetic transformations (ADP ATP); increase in oxygen consumption in the most superficial layers of the tissues with indirect activation of tissular metabolism and arteriovenous and lymphatic microcirculation.	Increase in the concentration of charges in high resistance tissues (such as the bone) with a slight increase in temperature in the most resistive area.
MEDIUM (moderately thermic) 100-200 watt	Biostimulating effect besides an increase of the local internal temperature in the area underneath the active electrode. With stimulation of higher calibre vessels and vasodilatation	Further increase in the concentration of charges in high resistance tissues (such as the bone), higher increase in internal temperature.
HIGH (plainly thermic) 200-300 watt	The biostimulating effect is reduced but with temperature increase, vasodilatation and consequent increase in hemolymphatic flow; local reddening of skin in the treated area. Acts on muscles, cartilages and bones	Significant increase in the concentration of charges in high resistance tissues (such as the bone), increase in temperature in the most resistive area, three-dimensional involvement of the bone. Deep vasodilatation even in arterial vessels.

The applicator supplied with our device also allows the adjustment of the supplied power through some buttons placed on the handle body; these make it possible to increase or reduce intensity without using the machine display.

09.Indications based on energetic level of work

LOW (athermy) increase the micro-circulation

- States of algia Edema and lymphatic deficit
- Inflammation
- Traumatic diseases in the acute stages
- Immediate post-operative
- Muscle injury in the acute phase
- Tendinitis

MEDIUM (medium-therm) vasodilatation

- Contractures
- Trophic muscle tone
- Circulatory deficit
- Problems of impingement
- Asthma and respiratory problems

HIGH temperature increase (hyperthermia)

- Stiffness
- Capsulitis adhesives
- Tendinosis
- Chronic inflammation
- Fibrous tissue / keloids
- Lymph edema

10.APPLICATION FIELDS

ELIMINATION OF PAIN AND RECOVERY OF MOBILITY

- Traumatology and general drainage of post-traumatic edema
- Inflammatory joint and tendon
- Musculoskeletal pains
- Treatment of diseases of the joints and periarticular
- Treatment of consequences of fractures
- Treatment in the post surgery followed by interventions of arthro prosthesis
- Phantom limb pain

10.SPORTS MEDICINE AND ATHLETES PREPARATION

- Acceleration of heating preparation pre - race
- Maintenance of athletic training
- Heating muscle
- Physiotherapy preventive
- Preparation for massage
- Preparing for physiotherapy
- Muscle regeneration
- Reclamation passive muscle
- Sports traumatology
- Trauma discursive

10.AESTHETIC MEDICINE AND DERMATHOLOGIC PATHOLOGY

- Psoriasis
- Acne and its scars
- Treatment of keloids and scars of recent
- P.E.F.S. Treatments
- Baker's cyst
- lymph edema

10.Applications of tecar therapy

- **Hip arthrosis**: The return plate appropriately placed under the thigh and resistive electrode positioned on the gluteal area: contrast the cartilage damage at the level of the femoral head which reduces the joint movement

•**Adhesive capsulitis of the shoulder:** a greater blood supply allows you to rehydrate more elastic and soften fibrotic tissue formed within the joint, promoting greater mobility. The subsequent treatment of the biceps brachi, brachialis and triceps brachial capacitive electrode favor ace the recovery of strength in the arm.

•***Spur heel syndrome*:** subject prone; the resistive electrode is applied to the plantar region of the heel. The massage of the foot with the electrode capacitance improves the elasticity of the plantar muscles.

•**Lumbago:** the use of the electrode resistive allows better hydration of the intervertebral discs. The treatment is completed with the use of the electrode capacitive along the muscle bundles with paravertebral muscle relaxant action that eg. in the case of osteoarthritis of cervical tract leads to a straightening of the spine .

Tecar therapy for lumbar disc hernia

1 STEP: CAPACITIVE MODE

Patient prone, with the plate positioned under the belly. At first treatment with the Capacitive medium-high because the diaphragm with pain in the spine the subject tends to bend onwards, then go on the paraspinal muscles of the affected area to relax the muscles, begin to move the hand piece along the column, do a paravertebral massage , gently rubbed the spinous processes . Taken from the column L5 to climb up to C6 - C7 , I also go on the inside corner of the shoulder.
Treatment of about 10 minutes.

2 STEP: RESISTIVE MODE

Then go to work with the electrode RESISTIVE in homeothermy. Gently work the gluteus , especially from the root of suffering , then massage the paravertebral as before, going up to C7 and then I stop for a bit ' on the diaphragm. If possible, ask the patient to do a few deep breaths , then I push the air from the chest to the belly . Return to the lumbar and sacroiliac joint , and if there is pain in the sciatic radicular for example , go along the course of the nerve root - always with Resistive down a little but the power and working in atermia - massage gently under the gluteus along the thigh , the calf, just below the ball of the foot . Work for about 14 minutes.

Resume again CAPACITIVE and so homeothermic work on the rachis. If the phase is acute make a more general work, but if the patient is in the sub-acute phase I focus more on the area of pain. If possible I match a current analgesic treatment on the affected area and pain along the nerve irritation. If the patient is unable to stretch on the couch I can work with the subject seated (ergonomic chair), plate under the buttock or leg below the root of suffering.

Tecar therapy for cervical hernia

In the cervical pathology mechanical aspect intersects psychological one aspect that should be taken during treatment , especially if it depends on the patient's psycho-physical stress. In the acute phase the patient is sitting possibly on ergonomic chair ; plate under the hand of the affected limb by irradiation of pain. Work with Capacitive medium heat on trapezes, paravertebral , go down towards the back , working on the diaphragm. I go back and I'm going to treat the shoulder blades , deltoids (about 8-10 minutes).

Step RESISTIVE to work in homeothermy the vertebral apophyses C1 -C2 up to the diaphragm , go back and a-thermy I go to work along the arm where the pain radiates down to the wrist (about 10-12 minutes of work resistive). Return to the neck and finish with Capacitive on the neck, shoulder blades and trapezes in homeothermy.

Then, if possible, work with the patient lying prone, to better treat your back and diaphragm.

Integrate the treatment with a sitting tecar across the posterior chain. If you can combine a treatment in the acute phase of current analgesic pain on the affected area and along the nerve irritation.

11. Recommendations

The endothermic treatment will undoubtedly prove to be even more effective if combined with a manual treatment, massa - physiotherapeutic or kinesitherapeutic.

In resistive mode, a low power is basically supplied for the treatment of acute pathologies (to prevent the increase of post-treatment pain) and a medium and high power in case of chronic pathologies. In case of a resistive mode treatment, we suggest:

- To start the session with a short treatment (approx. 5 minutes) in capacitive mode to slowly warm up and treat the area by softening the muscular tissue and improving its extensibility
- To proceed with a resistive mode treatment
- To close the session with a further short treatment (approx. 5 minutes) in capacitive mode to obtain a bio stimulating effect, which is ideal for reabsorbing any excess liquids, improving body vascularization and increasing the metabolic activity

Avoid treating patients with lower limb venous insufficiency.

Use a suitable quantity of coupling solution to avoid the generation of “points of strength” and an uneven distribution in the treated area.

Be careful with patients suffering from diabetic neuropathy or alterations of skin and peripheral nerve sensitivity (neuropathies, etc.).

12. Side effects and contraindications

Do not treat with this therapy:

- Patients wearing deep-brain neurostimulation implants for the treatment of Parkinson's disease.
- Patients suffering from cancer.
- Pregnant women.
- Patients wearing a pacemaker (we advise you to see a cardiologist first).
- Patients wearing metal prosthesis in the treated area (possibility of treating in capacitive mode only). under the supervision of a physician.
- In case of skin lesions in the area of application.
- Patients suffering from metastasis and neoplasia.
- Patients suffering from hemorrhagic ulcer.
- Acute inflammations (first 48/72 hours).

Main side effects:

In general, there are no side effects. However, in rare cases, patients treated with this therapy may experience, after the session… skin irritation and reddening of the treated area.

Be careful when you perform the treatment near periarticular serous bursas due to the risk of generating an inflammation of the bursa itself in resistive treatments (in particular olecranon bursa).

13. Benefits and Strengths

Main benefits of diathermic therapy

- Rapid pain relief: many patients have experienced a reduction of pain from the first session
- Reduced recovery time: a significant improvement has been noticed after only 3-5 sessions
- No medicines needed: pain is rapidly relieved without using pharmacological substances
- Wide range of use: the treatment modes have different possibilities of application
- Non-invasive therapy: The endothermic treatment generates heat directly into the concerned area without any specific contraindication
- Modern treatment: one of the most appreciated by sportsmen
- Widely used in sport, even as a pre-competition training; used by many athletes to obtain a correct warm up phase before competitions.