WOLVERHAMPTON WANDERERS FC
LITERATURE REVIEW

TECAR THERAPY IN SPORT

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INTRODUCTION

In the treatment of musculotendinous lesions in athletes, the ever-pressing need to strike a balance between preservation of the individuals' health; conservation of the societal aspect; and recovery in the fastest possible time can sometimes exceed all reasonable physiological and clinical considerations, often putting the physician of elite sports athletes in the spotlight regarding these issues, which can be in stark contrast to one another (Tranquilli et al 2009).

Muscular lesions deserve particular attention as they are very common in sport and account for substantial time lost from training and competition (Pollock et al 2014). From an athletics point of view, muscle injuries accounted for 48% of all injuries in a recent IAAF study (Alonso et al 2011) and accounts for 30% of all injuries; and 20-37% of all time lost in men's professional football; according to a study by Ekstrand (2011). This study also found that the vast majority (92%) affect the four major muscle groups of the lower limbs: hamstrings 37%, adductors 23%, quadriceps 19% and calf muscles 13%; with re-injuries causing significantly longer lay-offs than non-recurrent injuries.

Thermotherapy is a widely used modality in the preparation of muscle tissue and the treatment of musculoskeletal disorders (pain and injury to muscles, tendons and ligaments) in clinical practice and in sport. Tashiro et al (2017) proposes that thermal stimulation causes vasodilation, thus improving blood circulation and increasing temperature to a certain area of the body. Yokota et al (2017) also advises that the use of thermotherapy on muscle tissue can make it meaningful to evaluate the effect on muscle flexibility during the treatment process.

Recently, TECAR Therapy – a form of thermotherapy – has been included in the spectrum of possible therapeutic interventions for quick recovery of musculotendinous injuries in elite athletes (Tranquilli et al 2009). TECAR Therapy is an abbreviation of: Transfer of Energy - Capacitive And Resistive; this involved a generator that emits radio frequency signals of 0.5MHz at a variable power with a maximum of 300W (Ribeiro et al 2018). Ribeiro et al (2018) also states that it is characterised as a non-invasive high-frequency energy that awakens the body's natural ability to self-regenerate; promoting the natural processes of the tissue, metabolically transferring the energy without introducing radiation from the external environment. Due to the lack of direct radiation produced, the energy is produced by contact being applied with the body. TECAR Therapy promotes the natural processes of tissue metabolism by transferring energy without introducing exterior radiant energy (Hamawadeh 2014).

The Tecartherapy is a recent revolutionary technology to sports doctors and physiotherapists. TECAR therapy is a method for regenerating articular surfaces and muscular components in a particularly innovative way. The basic principle is to allow the stimulation of the natural mechanisms of self-healing of the body to promote the rapid rehabilitation of muscle and joint functions. TECAR technology is today recognized internationally and thousands of practitioners use it. TECAR therapy is a new treatment modality and has challenged the future of physiotherapy practice.

Tranquilli et al (2009) advises that this works on a principle that utilises biological tissue by treating it as electric resistance or as part of a condenser, enabling the homogenous involvement of the superficial layers as well as the deeper layers of biological tissue. This is virtually inexistent with irradiating systems where 30-40% of supplied energy is immediately dispersed into the first 10 microns of biological tissue. TECAR Therapy is also a safer system than other diathermy devices due to it not causing excessive heat generation between the skin and the electrode (Tashiro et al 2017).

Ganzit et al (2009) explains that the first electrode (Capacitive) is covered by an insulator, with the second (Resistive) being a conductive electrode. There are therefore two frameworks; one being a metal conductor plate (dielectric is opposite its surface) and the other is a type-2 conductor, formed from the biological tissue and from another metal conductor plate (Return Plate) that closes the circuit.

APPLICATION

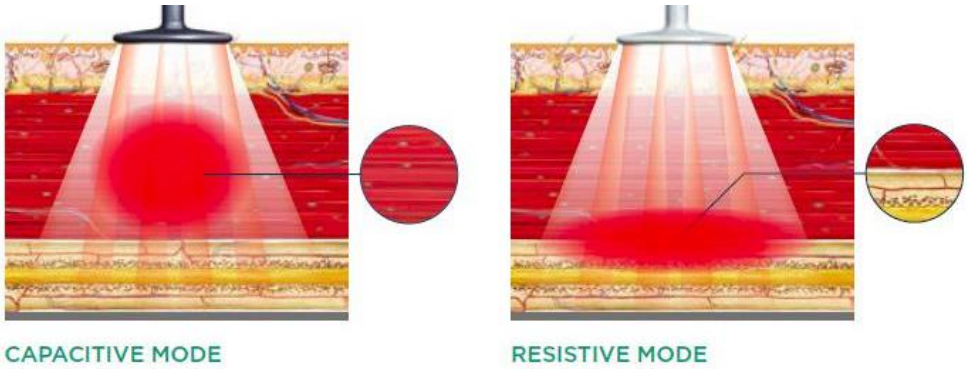
During the treatment, the skin temperature rises rapidly within the first 10 minutes and then at a slower rate in the subsequent minutes. After 20 minutes of the treatment, the increments are very slight, with some areas rising further dependant on circulatory flow (Ganzit et al 2009).

Ganzit et al (2009) implies that TECAR Therapy can be used on various areas of the body, as long as the electrode and counter electrode are positioned appropriately. For treatment of muscles the electrode is positioned with the return plate (counter electrode) closing the circuit on the opposite side of the limb. Treatment for joints is allowed by the electrode being positioned on one side of the joint and return plate (counter electrode) on the opposite.

In a study by Terranova et al (2008), the application of TECAR was daily, with the number of applications per day being altered depending on the stage of injury; this was used more in the acute stages (three times daily) which reduced to once daily towards the end of rehabilitation / treatment. They advised the use of the capacitive electrode first to ensure the area was heated sufficiently before including the use of the resistive electrode for deeper use. The timings altered also depending on the stage with more capacitive used in early stages, integrating the resistive in later stages. This is also suggested in a study by Hawamdeh (2014).

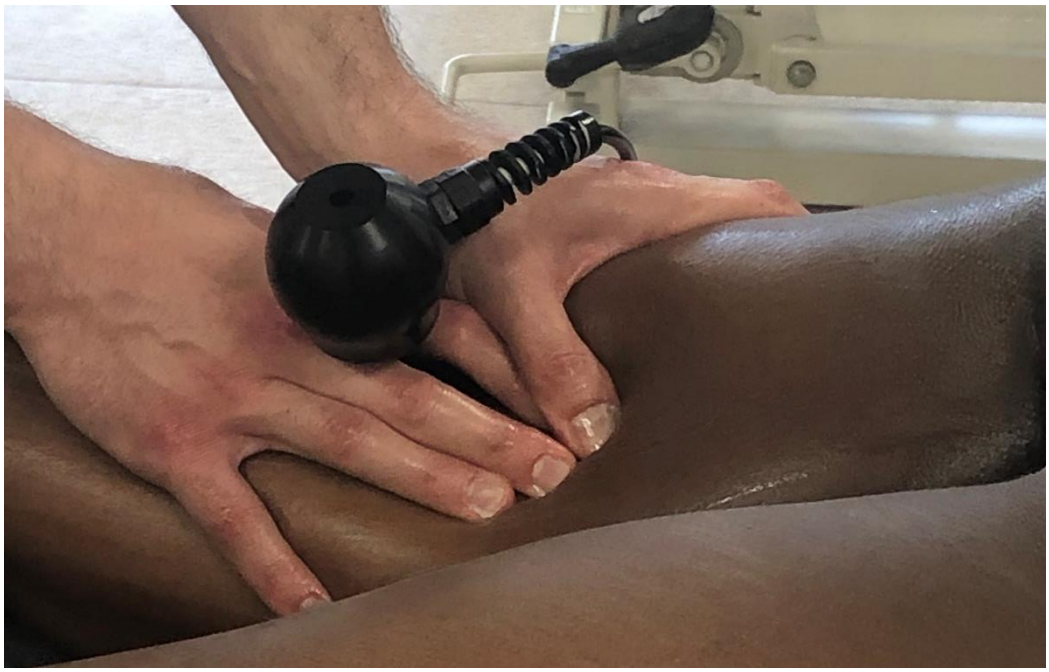
Yokota et al (2017) suggests the use of a manufacturer-supplied conductive cream is the most commonly used as a coupling medium between the active electrode and the skin surface during the intervention.

There have also been additions to the tools available with certain TECAR systems, Winback Academy (2018) introduces the use of fascial therapy with an IASTM tool, as well as the use of Traditional Chinese Therapy connected to the system (all in a resistive circuit). They have also introduced a Hot and Cold system called “Winshock” (also known as Thermal Shock Therapy) where the system switches from hot to cold within 25 seconds – more research is needed on these appliances.



Capacitive

The reactions produced by the capacitive electrode are focused on the tissues with higher electrolyte content, such as soft tissues and muscles (Ribeiro et al 2018). Yokota et al (2017) explains that the Capacitive electrode has a polyamide coating which acts as a dielectric medium (insulating its metallic body from the skin surface), therefore generating heat to the superficial layers of the body. Ganzit et al (2009) also confirms that there is a greater increase in energy in the muscles positioned closely to the capacitive (insulated) electrode, which is why it is important that the electrode is always moving to prevent burning.



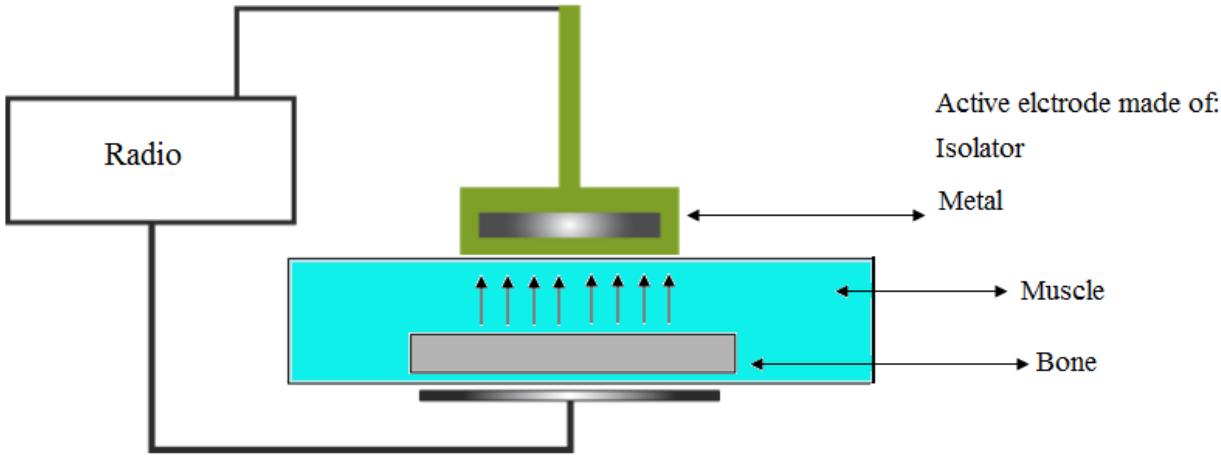


Figure 1: Capacitive Circuit Hawamdeh (2014)

Resistive

The reactions of the resistive electrode are focused on the larger and more resistant tissues, such as tendons, bones and joints (Ribeiro et al 2018). Yokota et al (2017) explains that the Resistive electrode is uncoated and passes radiofrequency (RF) energy directly through the body and into the inactive electrode (return plate), therefore generating heat in the deeper layers of the body. Ganzit et al (2009) clarifies that the higher energy density from the resistive electrode is close to the bone surfaces, which is also at the level of insertion of the tendons and ligaments and the articular surfaces of the joints. In this case the active electrode can be kept still and the increase in energy can still be felt, above all, in cases of insertion or articular pathology. All the conducting structures subjected to electromagnetic waves will have an increase in energy as there is an increase in ionic movement, where the waves accumulate, due to this there will be an increase in temperature.

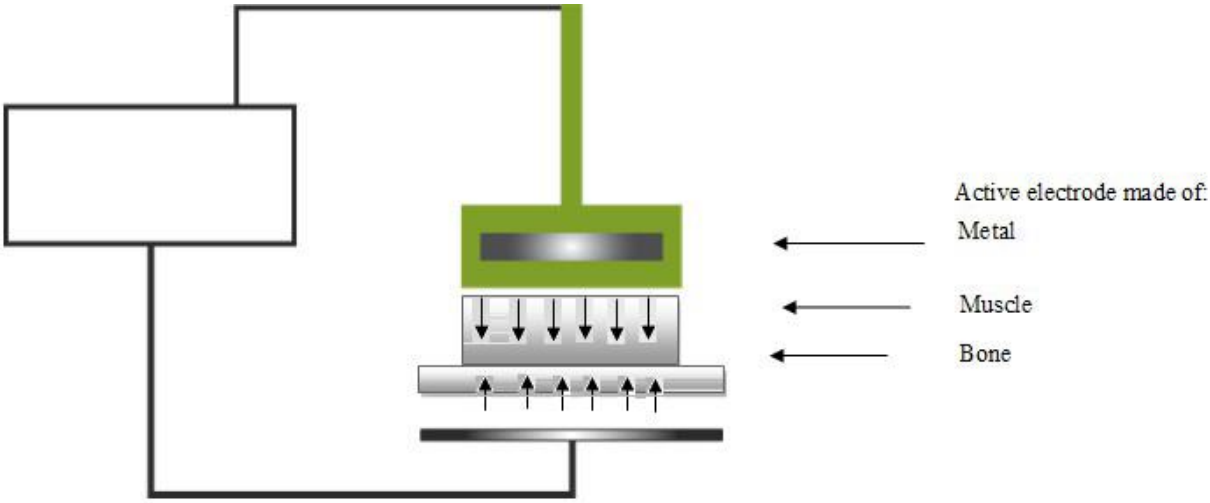


Figure 2: Resistive Circuit Hawamdeh (2014)

PHYSIOLOGICAL EFFECTS

This type of treatment appears to be appreciated by the patient from the very first session. The patient feels a reduction in pain making it easier for the therapist to work at depth and to help accelerate the rehabilitation process. The main physiological effect of TECAR Therapy is to increase the energy to a certain area of the body. Ganzit et al (2009) deems that this is achieved by an increase in extensibility of the collagenous tissue due to a reduction in viscosity. A reduction of pain due to anti-irritant action and release of endorphins. Also shows a reduction in muscular spasms and contractions due to the reduced activity of secondary afferents. In combination with rapid and complete dissociation of oxygen from haemoglobin with more availability; accompanied by a reduction in activation energy of important chemical and metabolic reactions. TECAR also aids in vasodilation with increase of local blood flow contributing to the re-supply of oxygen and nutritional substances as well as the removal of catabolites; and the quickening of re-absorption of haemorrhagic masses. This in turn results in an increase in microcirculation, oxygenation and internal temperature (Hawamdeh 2014) as per Figure 3.

Other possible effects that are relation to the electromagnetic field specifically may be envisaged but are yet to be demonstrated in current research.

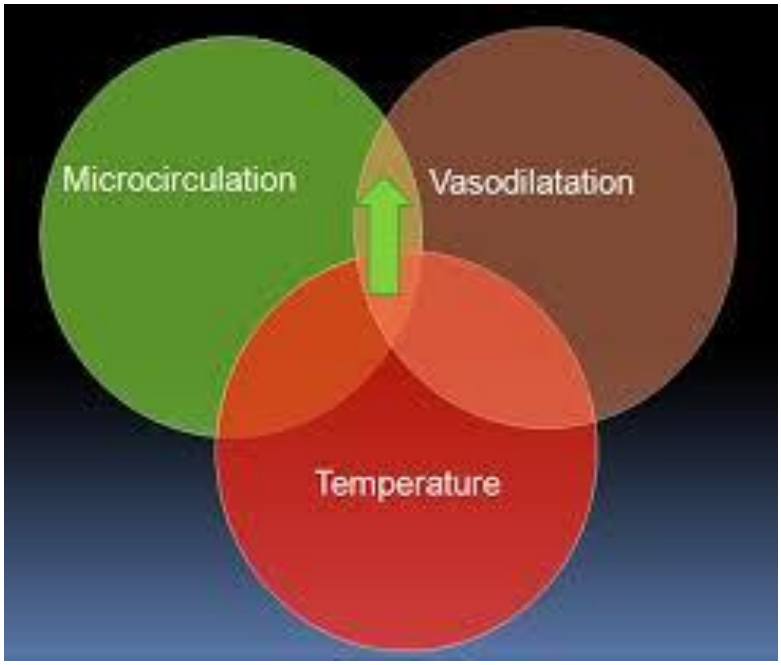


Figure 3: Physiological Effects of TECAR Therapy Hawamdeh (2014)

CONTRAINDICATIONS

With the use of TECAR Therapy the contraindications are generally linked to the contraindications in the use of Heat Therapy, such as infections and sensitivity deficits whereby the patient is unable to perceive or communicate the sensation of pain, as well as contraindications more specific to electromagnetic diathermy such as coagulopathy and thrombophlebitis (Ganzit et al 2009). Yokota et al (2017) added that the TECAR Therapy should not be used during pregnancy, deep vein thrombosis, hypoesthesia, damaged skin and with an implanted pacemaker.

DISCUSSION

In a study by Ganzit et al (2009) they found that the majority of patients expressed a reduction in pain and an improvement in function at the end of their treatment, the changes were statistically significant in acute and chronic cases, these were calculated using pre-treatment and post-treatment Steinbroker Index and VAS scale. Hawamdeh (2014) also showed that pain severity decreased by an average of 4 on the VAS scale following treatment using TECAR in acute and chronic pathologies; pain was measured at rest, on palpation and during movement. Yokota et al (2017) advises that TECAR Therapy helps increase the participants' tolerance to pain from muscle stretching with local thermotherapy increasing the pain threshold. This analgesic effect is considered to be due to the gate control theory of pain proposed by Melzack and Wall (1965). This theory, pain perception is modulated in the dorsal column by competing inputs from large-diameter non-nociceptive Aβ nerves transmitting information from cutaneous thermal, mechanical or electrical stimulation, and smaller-diameter nociceptive Aδ nerves and C-nerves transmitting painful information. The Aβ nerves activated by the thermal stimulation of the TECAR Therapy reduces the transmission of pain; therefore, the tolerance of pain from stretching the muscle increased (Melzak and Wall (1965). A study by Ribeiro et al (2018) also concludes that the pain is reduced using TECAR Therapy within in the 24 hours post treatment (in comparison to a group without TECAR), however there were no differences when it came to participating in a single leg hop test. In the same study they compared the use of TECAR with Laser and Electric Stimulation and found TECAR to have a more effective and immediate analgesic effect and a more rapid restoration of function on patients.

It is not known how long the effects of capacitive treatment lasts for, however a study by Yokota et al (2017) found that the effect on soft tissue flexibility was positive (SLR) following capacitive treatment alone, in comparison to a sham trial, until 30 minutes following treatment, this is put down to the extensibility of the soft tissue, including connective tissue composed primarily of collagen fibres. A prolonged effect after 30 minutes should be researched more. Many studies have researched the use of TECAR Therapy on muscle flexibility, but also used stretching alongside the treatment, therefore more research is required.

Hawamdeh (2014) found that the thermal effect of the TECAR Therapy, helped in the release of Oedema by increasing the temperature of the superficial and deeper layers of muscle tissue. This is turn increases the blood flow and reduces the inflammation around the point of trauma (in a contusion) – in this study they found that daily treatments over 4-5 days helped reduce the inflammation significantly (observed by Ultrasound Scanner). It was noted that in their findings in the research it is vital that the oedema is not treated using thermal therapy until at least 48-72 hours following injury to allow the tissue to settle and avoid causing further damage in soft tissue pathologies. This is confirmed by Tranquilli et al (2009), who state that TECAR Therapy is valid for adequate and fast resolution od oedema and its potentially resulting serum and blood accumulations; being well accepted by demanding patients who feel the beneficial effects in regards to pain and functional limitation as early as initial sessions.

Yokota et al (2017) found, in a review of a number of studies, that there was a greater increase in muscle temperature in all modalities involving thermotherapy, with this increase causing vasodilation; hence, the blood circulation was also improved to the area. Their study found the blood circulation improved to a similar degree in TECAR Therapy and other forms of thermotherapy.

Ribeiro et al (2018) suggests that the main advantage of using TECAR Therapy in a sporting environment is that it can significantly improve recovery time in acute and chronic injuries, this being vital ion sports as patients / players have reduced periods of rest time in order to train. Following training / competition the player can suffer from delayed onset of muscle soreness which can be recovered from in a faster, more efficient way using TECAR Therapy.

CONCLUSION

TECAR Therapy is a relatively new modality which has had some positive results in pain relief, increasing blood circulation and in reducing inflammation. There are also positive results when it comes to muscle flexibility and recovery time, however these studies were on small groups. Negative results were found on anti-inflammatory treatments within the acute phase of healing (within 48 hours). In short, the results of this literature review demonstrate that TECAR Therapy could be a good adjunct to use in a sporting physiotherapy environment, alone or in combination with movement or overlapping with other modalities, showing advantages in acute and more chronic conditions. Whilst allowing an earlier treatment to be started; but also having the ability to witness therapeutic effectiveness after a single treatment session. Overall more research is required to be done on the subject to test its effectiveness in a range of different circumstances.

REFERENCES

- Alonso J.M. et al (2011) Determination of future prevention strategies in elite track and field: analysis of Daegu 2011 IAAF Championships injuries and illnesses surveillance. British Journal of Sports Medicine; (46) 505-514
- Ekstrand J. et al (2011) Epidemiology of muscle injuries in professional football (soccer). American Journal of Sports Medicine; (39) 1226-1232
- Ganzit G et al (2009) Tecar Therapy in the Treatment of Acute and Chronic Pathologies in Sports. FMSI Institute of Sport. (10) 21-34
- Hawamdeh M (2014) The effectiveness of Capacitive Resistive Diathermy (Tecartherapy) in acute and chronic musculoskeletal lesions and pathologies. Eur J Sci Res (118) 336–40
- Melzack R. and Wall P. (1965) Pain mechanisms: a new theory, Science 150:971-979
- Pollock N. et al (2014) British athletics muscle injury classification: a new grading system. British Journal of Sports Medicine; 48(1) 1347-1351
- Renaudin M (2018) A eficiencia da Tecarterapia em Fisioterapia: Revisao bibliografica. Universidade Fernando Pessoa. 1-15
- Ribeiro S. et al (2018) The Effectiveness of Tecar Therapy in Musculoskeletal Disorders. International Journal of Public Health and Health Systems; 3 (5) 77-83
- Tashiro Y. et al (2017) Effect of Capacitive and Resistive electric transfer on haemoglobin saturation and tissue temperature. International Journal of Hyperthermia; 33 (6) 696-702
- Terranova A et al (2008) Tecarterapia nel trattamento post-chirurgico della fratture di femore. European Journal of Physical Rehabilitation and Medicine 44 (3) 1-2
- Tranquilli C. et al (2009) Multicentre Study on Tecar Therapy in Sports Pathologies. FMSI Institute of Sports Medicine (1) 1-11
- Winback Academy (2018) Newsletter Winback Academy #4. www.winback.com
- Yokota Y. et al (2017) Effect of Capacitive and Resistive Electric Transfer on Tissue Temperature, Muscle Flexibility and Blood Circulation. Journal of Novel Physiotherapies (7) 325