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Effectiveness of TECAR Therapy and Therapeutic Exercise in the Treatment of Musculoskeletal Conditions: A Review Article

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Abstract:- TECAR Therapy or Transfer of Energy and Resistive Therapy (TT) is a non-invasive treatment that uses a device that will induce heat production inside the body to treat inflammatory disorders. Many studies have been conducted on the effectiveness of TECAR Therapy and therapeutic exercise in the treatment of musculoskeletal conditions. However, some studies have contradicting conclusions in terms of their effectiveness in treating musculoskeletal conditions. In this review article, we gathered different researches and reviewed their results and findings regarding the effectiveness of TT and therapeutic exercise. In conclusion, TT as a stand alone treatment or as an adjunct to conventional physiotherapy protocols has been proven to have beneficial effects in treating musculoskeletal conditions.

Keywords:- *TECAR Therapy, Therapeutic Exercise, Musculoskeletal Condition.*

I. INTRODUCTION

TECAR Therapy or Transfer of Energy Capacitive and Resistive Therapy (TT) is a non-invasive treatment that uses a device that will induce heat production inside the body to treat inflammatory disorders. Although TT is still not highly investigated, particularly its physiological and biochemical effects, therapists frequently utilize TT for musculoskeletal conditions, and it is being recognized in physiotherapy facilities for its therapeutic benefits. [1]

The use of TECAR therapy as a modality for physiotherapeutic purposes along with traditional rehabilitation programs may be advantageous. [2] Several studies showed that TECAR therapy combined with therapeutic exercises such as mobility, stretching and strengthening exercises has been proven effective in pain relief and earlier return to function. [3][4][5] However, in a study conducted by Bito, et al (2019), it was found that Deoxy-Hb (deoxyhemoglobin) levels and tendon elongation changes did not differ significantly amongst the treatments despite the increase of the total-Hb (total hemoglobin) and oxy-Hb (oxyhemoglobin) levels in the sham trial. (CRet vs. sham: oxy-Hb: $F = 8.063$, $p = 0.001$, total-Hb: $F = 4.564$, $p = 0.011$). [6] In addition, Diego, et al (2019) did not find any changes in chronic myofascial neck pain through Visual Analog Scale (VAS) between the placebo group and the treatment group which received radiofrequency. [7]

One of the current comprehensive plans of care in Physical Therapy is using TECAR therapy as an adjunct to therapeutic exercises in managing musculoskeletal disorders, which include muscle and joint pain, contracture, sprains and strains and ligamentous injuries. [1][2][3] However, there are still studies that have conflicting results. [6][7] This review aims to determine the effectiveness of TECAR therapy combined with therapeutic exercise in treating musculoskeletal conditions by summarizing the findings of various studies on TECAR therapy.

II. METHODS

This review was conducted using databases such as PubMed, Cochrane, ResearchGate, NCBI and Google Scholar. The search was done in February of 2023. The search used keywords like TECAR therapy, therapeutic exercises, musculoskeletal conditions, and/or a combination of the keywords. *Inclusion criteria* for choosing studies to be reviewed were the following: studies done from 2018 up to the present, studies utilizing clinical trials as research method, studies on TECAR therapy as a treatment for musculoskeletal conditions, studies done on TECAR therapy and therapeutic exercise as treatment for musculoskeletal conditions, and studies on musculoskeletal conditions. The medical condition, intervention and outcomes of the treatment were the parameters being considered. *Exclusion criteria* included studies that utilized another form of heating modality in addition to TECAR therapy, studies done on non-human subjects or non-living subjects and studies focused on non-musculoskeletal indications.

III. DISCUSSION

- *TECAR Therapy*

TECAR therapy (TT) is characterized as a non-invasive high-frequency energy that ranges from 300 KHz to 1 MHz and may improve the body's capacity for self-regeneration. [2] It is a form of endogenous thermotherapy that is utilized to warm up both superficial and deep tissues. The potential of TT to influence blood flow is frequently regarded as the primary mechanism for promoting tissue healing

processes. [8] Other physiological effects include improved microcirculation and vasodilation, increased oxygenation and metabolic process activation, and increased body temperature and capacity. [9] Thus, the synergistic impact between manual therapy and TECAR therapy results in a more effective rehabilitation procedure, according to the TECAR therapy's previously mentioned properties. [10]

- *Musculoskeletal Injuries*

In sports, the most frequent physical disability is caused by muscle injuries. According to statistics, soft tissue injuries account for between 30 and 50 percent of all injuries sustained while participating in a sport. [11] Any trauma that damages muscles, bones, tendons, joints, ligaments, and other soft tissues is a musculoskeletal injury (MSK-I). One of the most prevalent health issues affecting athletes is MSK-Is, which has financial repercussions in addition to performance declines or competition withdrawals. [12]

- *Therapeutic Exercise and TECAR*

Nearly every recovery program uses manual therapy to treat musculoskeletal disorders. Its efficacy, however, is still debatable, necessitating considerably more efficient and faster rehabilitation techniques. Recent developments in deep thermotherapies, such as capacitive and resistive electrical transfer (TECAR), are used in sports medicine. This equipment emits radio frequency energy, which travels between an active and an inactive electrode to warm the body. [8][11] This type of treatment has demonstrated that TECAR therapy is more effective in promoting blood circulation than a warm pack, a traditional form of thermotherapy frequently used in clinical practice. Enhancing blood circulation, increasing the rate of cellular metabolism, and the extensibility of soft tissues is crucial for enhancing muscle recovery from exhaustion. [8][11] As a result, TECAR therapy successfully enhances muscle recovery following exhaustion. Maintaining and enhancing muscle flexibility, it appears to be a more effective treatment option for muscular diseases than standard manual therapy since it speeds up the recovery process on muscle tissue compared to the latter, where vasodilation and cellular metabolism are not as strongly stimulated. TECAR therapy results are significantly more satisfying for therapists and patients because they balance the therapist's manual ability and the distinctive energy that this technology exudes from the tissues. [6][13]

Table 1 note: add interventions comparisons; explain the groups; una results than the outcomes ;

Author Year of Study	**Condition Under Study**	**Intervention**	**Outcomes**	**Result**
Diego, et al 2019	Myofascial chronic neck pain	TECAR therapy	Pain relief Improve ROM Improve neck function	Potential effect on pain intensity using the monopolar capacitive, resistive RF
Bito, et al 2019	Achilles Tendon elongation	TECAR therapy vs placebo (SHAM trial)	Changes in tendon elongation Changes in blood circulation	No change in tendon elongation in both groups Significantly improved blood circulation in the TECAR group
Munteanu, et al 2020	Anterior cruciate ligament injury post surgery LOM Decrease function	Kinetic recovery program vs TECAR dynamic and static therapy (with kinesiotherapy program and cryotherapy techniques)	Pain relief/ Analgesic effect Early mobility and return to function Reduced complications postop	Optimal flexion rates in the TECAR group No significant difference in analgesic effect for both groups More myorelaxant effect in the TECAR group
Iacob 2020	Low back pain	TECAR therapy with manual therapy	Muscle spasm reduction Soft tissue elongation Pain-relief	Effective treatment option for low back pain.
Paolucci 2020	Shoulder impingement syndrome	TECAR therapy vs Sham trial	Pain relief Return to function	Improvement in VAS score in the TECAR group Functional scales improved in the TECAR group
Clijsen 2020	Temperature and perfusion of skin and muscle circulation	TECAR therapy	Perfusion of skin microcirculation and intramuscular blood flow	On Doppler sonography and laser speckle contrast imaging, there was a significant change with TECAR application
Yeste-Fabregat 2021	Myofascial pain syndrome involving	TECAR therapy vs SHAM trial	Skin temperature	Significant increase in skin temperature in the TECAR

	the gastrocnemius in basketball players		Ankle ROM Pain relief Return to function	group No significant improvement in ankle mobility
Iacob 2021	Hamstring strain in male football players	TECAR therapy with progressive active exercises, stretching and sporadic cryotherapy	Pain relief Incresase in ROM Muscle strength	Improvement in pain Improved functionality
Davari, et al 2021	Ankle Sprain in athletes Pain LOM Swelling Decreased function	TECAR therapy with conventional treatment vs Conventional treatments	Pain relief Decreased swelling Increase in ROM Improving function	Decreased pain in the TECAR group after 6-12 sessions Significant decrease in swelling for both groups, more after 12 sessions Significant difference in return to function after 12 session vs 6 sessions

In 2019, a study conducted by Diego, et al, in Spain, tested the effectivity of TECAR therapy on patients with chronic myofascial neck pain and yielded a potential benefit to relieving said pain.

In 2020, several studies conducted on different types of musculoskeletal disorders yielded significant results, including improvements in ROM, decreased pain and early return to function.

In 2021, a study conducted by Iacob, et al on professional basketball players, showed the significant improvement in pain scales and improvement in function.

IV. CONCLUSION

As shown in many international studies, TECAR therapy (TT) as a standalone treatment or as an adjunct to conventional physiotherapy protocols has been proven to have beneficial effects, like increase in skin temperature, increase in blood circulation, increase in soft tissue elasticity, and decreased pain level. This in turn facilitated tissue healing, improved the patient's ADL and hastened recovery. Based on the significant results in the studies reviewed, the authors recommend conducting local studies on TECAR therapy.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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