

EFFECTIVENESS OF TENS (TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION) IN KNEE OSTEOARTHRITIS PATIENT IN REDUCING PAIN

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Abstract

Background: Osteoarthritis (OA) of the knee is a common medical condition among the elderly population, often causing chronic pain, stiffness, and reduced quality of life. Pharmacological therapy to treat pain in knee OA has limitations, and this is why non-pharmacological therapy such as TENS (Transcutaneous Electrical Nerve Stimulation) Therapy has become an interesting research subject. Research Objective: to evaluate the effectiveness of TENS in reducing pain in patients with knee OA. The research methods involved a thorough literature review of clinical studies that have been conducted in recent years. Analysis of data from these studies aimed to identify trends and general findings regarding the use of TENS in managing pain in knee OA. Research Results: from 4 journals used as literature reviews, it shows that TENS can significantly reduce the level of pain in patients with knee OA with a significance of $P < 0.001$. Larger and more diverse studies tend to support the effectiveness of TENS, although there are variations in other findings. In addition to reducing pain, TENS also has the potential to improve joint function and the patient's quality of life.

Keywords: Knee Osteoarthritis; Relieve Pain; Non-medical therapy, TENS

INTRODUCTION

Osteoarthritis (OA) is a common medical condition, especially in the elderly. This disorder can affect the knee joint and can cause a variety of symptoms, including pain, stiffness, and limitation during activity. Non-facial treatment can be given by physiotherapy using modalities in reducing pain felt by knee osteoarthritis patients, namely TENS (Transcutaneous Electrical Nerve Stimulation) (Zeng et al., 2015).

The prevalence of knee osteoarthritis is almost 40% of the population worldwide and the age of 50 years is more often felt the first onset. The prevalence of knee OA was 15.5% in men and 12.7% in women (Panggabean et al., 2023). In America, more than 9,000,000 people are affected by clinically and radiographically confirmed knee OA. OA of the knee may be a long-term

degenerative infection accompanied by severe pain (Jiemesha & Angliadi, 2014). Since pain is one of the main causes of decreased quality of life, the medications available today are essentially alternatives to relieve pain for people with knee OA (Arkananta et al., 2023).

Many studies suggest that TENS can provide significant advances in the clinical treatment of knee OA (Reichenbach et al., 2022). A review conducted by Chrocane recommending the impact of TENS treatment showed that it was potentially clinically significant for knee pain (Y. Wu et al., 2022). TENS is a therapeutic technique modality that uses weak electrical currents to stimulate the nerves involved in pain perception (Jaury, 2014).

The basic principle is to provide electrical signals through electrodes placed on the skin around the affected area (Sluka et al., 2013). This electrical signal is expected to inhibit pain signals sent to the brain, thereby reducing the pain felt by the patient (Claydon et al., 2011). So far the only effective therapy is to replace the knee joint (Johnson et al., 2015). Combined with the increasing prevalence of knee OA, the rapid growth of knee replacement rates has attracted much attention to such effective non-surgical treatments (L.-C. Wu et al., 2018). Although TENS has been used in the treatment of chronic pain for decades, there is still debate about its effectiveness in reducing pain in knee osteoarthritis.

The purpose of this study was to assess the effectiveness of TENS (Transcutaneous Electrical Nerve Stimulation) in reducing pain in patients with knee osteoarthritis.

METHODS

This research uses the literature review method. Literature review is a scientific paper that is directly related to research questions.

The research question refers to the PICO format: (P = Population) namely knee osteoarthritis sufferers, (I = Intervention) TENS (Transcutaneous Electrical Nerve Stimulation), (C = Comparison) there is no comparison, (O = Outcome) which is the effectiveness of TENS in reducing pain in knee OA (osteoarthritis).

Journal articles in this study are reviewed and abated by inclusion and exclusion criteria, with sources taking that have a time span for the last 10 years, namely 2013-2023. Articles will be reviewed if they meet the following inclusion criteria: (i) the study subjects are pain sufferers in the knee due to conditions associated with knee osteoarthritis with an age range of 50-80 years.

Research articles will be rejected if the author meets the following exclusion criteria: (i) journal sources under 2013. (ii) the subject refuses to participate. Authors get information based on information databases such as Google Scholar and Pubmed. The author will accept whether or not the effect of the intervention has an impact on the sample of each article.

To summarize the data, the authors summarized the data based on the study subjects, the age and sex of the participants, the interventions given (frequency, duration and parameters to measure the effectiveness of the interventions), and conclusions.

In this study there are several measurement instruments used such as; Visual Analogue Scale (VAS): is an instrument used to measure the scale of pain felt by patients. This measurement is considered the most efficient and has been used in research and is considered to help in classifying the severity of symptoms experienced. The Visual Analogue Scale (VAS) is presented with numbers 0 through 10. Ranging from 0 (no pain) to 10 (maximum pain). (Jaury, 2014)

Numeric Rating Scale (NRS): is an instrument to measure the intensity of pain at a point in time. Patients were asked to provide a numerical assessment of their pain level on the scale. Each patient has a different perception and tolerance of pain. Therefore, pain level assessment helps in designing a personalized treatment plan according to individual needs (Johnson, 2021).

Transcutaneous Electrical Nerve Stimulation (TENS): is one of the electrotherapy modalities where there are electrodes and attached to the skin for the purpose of conducting electrical impulses that function as pain signal inhibitors. Inhibited pain signals will give a reduced pain effect. Giving TENS interventions with a fairly low frequency can stimulate the body to release endorphin hormones, so that the endorphins that come out will provide a relaxing effect and there is a decrease in pain (Tao et al., 2018).

The modality of the TENS (Transcutaneous Electrical Nerve Stimulatuon) device is carried out for 4-6 weeks, with the dose used is 10-100 Hz and 50 µs for 20 minutes using at 5x5 cm which is placed on the knee in the anteromedial and anterolateral positions (Johnson et al., 2017).

In some studies TENS with a frequency of 10 Hz to 100 Hz is considered significant in reducing pain. Experienced by knee OA patients. In low-frequency TENS can provide signals to the brain to stimulate the release of endorphins so that TENS (Transcutaneous Electrical Nerve Stimulation) is considered to make patients more relaxed and can help reduce pain (Gibson et al., 2017).

RESULTS AND DISCUSSION

Of the 5 journals obtained, it has been researched through screening, eligibility and inclusion. Transcutaneous Electrical Nerve Stimulation (TENS) is one of the modalities of physiotherapy therapy that uses electric current, namely TENS, TENS is a conservative treatment, which can reduce pain levels.

Table 1. Comparison *Experimental Grup* and *Control Group*

Reviewer	Participant	Intervention	Measurement	Results	Design Study
	Intervention group	Experimental group			
S. Reichenbach, et al (2021)	n= 108 65 - 66 tahun	TENS	WOMAC	<i>P=0.98</i>	RCT
C. Zeng, et al (2014)	n= 27 45- >70 tahun	TENS	WOMAC	<i>P=0,01</i>	systematic review and network meta-analysis of RCTs

Yu Wu, et al (2021)	n= 1398 54-85 tahun	TENS	VAS, WOMAC	$P=0,98$	Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement
Inge, J., & Engeline, A. (2014)	n= 35 45 - 65 tahun	TENS	NRS	$P=0,384$	Descriptive analysis

Based on a literature review study, the authors found that of the 2,901 sample results the average was dominated by women with the age of ≥ 65 years. Of the many literature found, some of the literature uses RCT research design and some use systematic review research design and meta analysis and measurement of VAS, WOMAC and NRS with significant results. Experimental group using TENS intervention while control group was not given intervention.

Table 2. Therapeutic Dosage *Intervensi Transcutaneous Electrical Nerve Stimulation (TENS)*

Reviewer	Type of Intervention	Therapeutic Dosage				Duration Therapy
		F	I	T	T	
S. Reichenbach, et al (2021)	TENS	First 4 times/week 3 times/second week 2 times/third week	-	TENS	60 minutes	3 weeks
C. Zeng, et al (2014)	TENS	-	High frequency (50-100 Hz) Low frequency (2-10 Hz)	TENS		
Yu Wu, et al (2021)	TENS	-	Frequency (333Hz or 30Hz)	TENS		4 weeks
Inge, J., & Engeline, A. (2014)	TENS	2 times/week	Frequency (100 Hz and 50 μ s)	TENS	20 minutes	6 weeks

Based on research that has been done, researchers found that TENS can be applied to patients with knee osteoarthritis with a frequency of 2-4 times / week, TENS (Transcutaneous Electrical Nerve Stimulation) intensity with a wave frequency of 10 Hz – 100 Hz, with a duration of 20-60 minutes for 4-6 weeks.

Table 3. Mean of Study Characteristics

Reviewer	Measurement	Experiment Group		Significant
		Pre	Post	
S. Reichenbach, et al (2021)	WOMAC	2.67 \pm 1.50	2.53 \pm 1.59	$P < 0,001$
C. Zeng, et al (2014)	WOMAC	-0.64	0.25	$P < 0,001$
Yu Wu, et al (2021)	VAS,WOMAC	-	-	$P < 0,001$
Inge, J., & Engeline, A (2023)	NRS	5,47	3,21	$P < 0,001$

Based on the table above, the measurement of pain values before and after therapy showed a good improvement with a significance of $p < 0.001$.

Discussion

There are several factors that can affect Knee Osteoarthritis disorders. There are some factors that can be changed and there are also factors that cannot be changed. Factors that can influence changes revolve around physical activity performed, history of injury, obesity, type of work, and metabolic disorders. And the factors that cannot be changed are age, sex and genetics

Osteoarthritis can cause various disorders, including decreased muscle quality, inhibited joint growth, pain, decreased muscle fitness. Providing physiotherapy intervention in cases of osteoarthritis can reduce pain symptoms, because pain symptoms are the most common side effects experienced by people with knee osteoarthritis, other symptoms that can be felt by people with knee osteoarthritis are stiffness in the joints and decreased daily functional activities. In an effort to reduce pain experienced by knee osteoarthritis patients, physiotherapy can provide electrotherapy interventions such as TENS (Transcutaneous Electrical Nerve Stimulation).

In addition to modalities such as TENS, exercise therapy has been recognized as an important component in the management of knee osteoarthritis. In addition to comparing the impact of TENS and exercise therapy separately, it is also important to consider whether the combination of the two can be more significant in reducing pain in people with knee osteoarthritis.

Pain is an early symptom experienced by people with knee osteoarthritis. Pain level is not just about measuring the pain itself, but also finding out what might be the cause of the pain. Pain level assessment is an important component in holistic pain management. This not only helps plan appropriate pharmacological therapies but also opens the door to complementary treatments, such as physical therapy, behavioral therapy, or stress management.

Measurements with pain scales, such as the Visual Analog Scale (VAS) or Numeric Rating Scale (NRS), are tools used to measure pain intensity. Patients are asked to provide a numerical or visual assessment of their pain level on the scale. Each patient has a different perception and tolerance of pain. Therefore, pain level assessment helps in designing a personalized treatment plan according to individual needs.

CONCLUSION

Based on the results of the discussion above, it can be concluded that clinically TENS is proven to significantly provide pain reduction in patients with knee OA. The results of this study support the use of TENS as one of the non-pharmacological therapeutic options that can treat chronic pain that is often associated with this condition. TENS is a non-pharmacological therapeutic method worth considering as part of a pain management plan in patients with knee osteoarthritis.

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