EFFECTIVENESS OF TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION, EXERCISE THERAPY, AND KINESIO TAPE TO REDUCE SYMPTOMS IN DIABETIC PERIPHERAL NEUROPATHY PATIENTS: A CASE REPORT

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Abstract

Introduction: Diabetic Peripheral Neuropathy (DPN) is one of the microvascular complications of diabetes, which occurs due to high levels of sugar in the blood, resulting in damage to a group of nerves. The purpose of this study is to determine the effectiveness of the giving of Transcutaneous Electrical Nerve Stimulation (TENS), Exercise Therapy, and Kinesio Tape in cases of Diabetic Peripheral Neuropathy.

***Case Presentation*:**The patient in the study was a 64-year-old woman with a diabetes history who complained of tingling, a slight numbness, and a burning sensation in both legs. The complaints will worsen at night.

***Management and Outcome**:*The subject got therapy in Transcutaneous Electrical Nerve Stimulation (TENS), Exercise Therapy, and Kinesio Tape as many as three times. The Paraesthesia was measured using the numeric pain rating scale (NPRS), lower extremity muscle strength was measured using 5STS, the static balance using MCTSIB, and the dynamic balance using TUG.

Discussion:After being given therapy, It obtained results in the form of decreased Paraesthesia measured using the Numeric Pain Rating Scale (NPRS) silent pain T1: 10 to T3: 9, motion pain T1: 10 to T3: 9. Increased muscle strength in lower extremities and postural in T1: 18 to T3: 15. Increased static balance from T1:0.35 to T3:0.41. Improved dynamic balance from T1:14.90 to T3:14.45.

Conclusion:Therapy in Transcutaneous Electrical Nerve Stimulation (TENS), Exercise Therapy, and Kinesio Tape effectively reduces Paraesthesia, increases lower extremity and postural muscle strength, improves static balance, and improves dynamic balance.

Keywords: Diabetic Peripheral Neuropathy(DPN), *Transcutaneous Electrical Nerve Stimulation* (TENS), *Exercise Therapy*, *Kinesio Tape*.

Introduction

Diabetic peripheral neuropathy (DPN) is one of the microvascular complications of diabetes, which occurs due to high sugar levels in the blood, resulting in damage to a group of nerves[8]. Symptoms that arise due to DPN are tingling, guesswork, pain, sensations such as wearing socks (thick), the inability to feel pain, and distinguish heat or cold. As a result of these symptoms, it increases the risk of falls, burns, ulcers, and injuries[7]. DPN patients reach 60-70%, this is supported by previous studies[10]. In 2016, 243 million people were experiencing DPN[9]. DPN risk factors include diabetes, hyperglycemic, age, and gender. Hormonally, estrogen causes women to experience more DPN because the absorption of iodium in the intestines is disrupted so that the process of formation of nerve myelin does not occur.[2].

Various modalities owned by physiotherapy in overcoming DPN were many. One of them is transcutaneous electrical nerve stimulation. It can help reduce Paraesthesia in DPN[6]. Exercise therapy can increase macrovascular and microvascular factors in DPN and can improve gait function[5]. The application of Kinesio tape can reduce Paraesthesia, normalize muscle function, and dynamic stabilization[7].

Based on the background above, researchers want to know the effectiveness of transcutaneous electrical nerve stimulation (TENS), exercise therapy, and Kinesio tape in the case of Diabetic Peripheral Neuropathy.

Case Presentation

A 64-year-old woman,as a retired teacher, complained of tingling, slight numbness, and burning in both legs. The complaints worsened at night. The patient had a history of diabetes for approximately ten years. The patient's family also has a history of diabetes. The highest blood sugar level of the patient reached 292 mg/d. When screening for neuropathy using the Michigan Neuropathy Screening Instrument (MNSI) with a physical test score of 3. Kaymaz et al. [1]said a person was diagnosed with diabetic peripheral neuropathy when the physical examination score was ≥2.5. In addition, on the examination, there is also a weakness in the lower extremity and postural muscles and the presence of static and dynamic balance disorders.

Management and Outcome

The measuring instrument used in this patient was the NPRS (Numeric Pain Rating Scale) to measure Paraesthesia. With a value of 0 (no sense of Paraesthesia) up to 10 (Paraesthesia dominates). The 5 Times Sit-To-Stand Test (5STS) measured lower extremity and postural muscle strength with normal results for ages 60-69 years: 11.4 seconds. The Modified Clinical Test for Sensory Interaction on Balance (MCTSIB) was used to measure static balance, with scores of <0.20 (bad), 0.21-0.40 (enough), 0.41-60 (moderate), 0.61-80 (good), and 0.81-1.00 (very good). with scores of <10 seconds (normal), 10-<20 (light fall risk), 20-29 (moderate fall risk), >30 seconds (high fall risk).

Physiotherapy interventions were given to this patient in the form of TENS, exercise therapy, and Kinesio tape installation. In providing the TENS was a flow of <35 mA at a frequency of 20 Hz for 15 minutes 3 times a week—installation of TENS on lower extremities. The exercise therapy provided was pumping action combined with strengthening, exercises in the form of standing with tiptoe for pumping action, and one-leg stand and tandem walk for strengthening and balance. Each exercise was done as many as 10x reps three times a week. Installation of Kinesio tape with a pull of 0% using Kinesio tape I began with the position of the patient's feet in full plantar flexion, then installed Kinesio tape one by one from the thumb to the pinkie. Then installed Kinesio tape with the full dorsi foot flexion position, installed one by one from the thumb to the pinkie.

Result

Table 1 Paraesthesia using NPRS

NPRS	T1	T2	T3
Constant pain	10	10	9
Motion pain	10	10	9
Pressure pain	0	0	0

Based on the table above, measurement of Paraesthesia using NPRS obtained the results of constant pain T1: 10; motion pain: 10; pressure pain: 0. After being given TENS, exercise therapy and Kinesio tape decreased from T3 to constant pain of 9 and motion pain of 9.

Table 2 Lower Extremity and Postural Muscle Strength using 5STS

	T1	T2	T3
5STS	18	15.29	15

Based on the table above, lower extremity and postural muscle strength reduced using 5STS obtained the result of increased muscle strength from T1: 18 after being given TENS, exercise therapy, and Kinesio tape installation increased to T3: 15.

Table 3 Static Balance using MCTSIB

	T1	T2	T3
MCTSIB	0.35	0.38	0.41

Based on the table above, static balance measurement using MCTSIB obtained results of increased static balance. From T1: 0.35. After being given TENS, exercise therapy, and Kinesio tape, there was an increase in T3: 0.41. Although the increase is not significant, there has been an increase initially in the value category into a medium value category.

Table 4 Dynamic Balance using TUG

	T1	T2	T3
TUG	14.90	14.56	14.45

Based on the table above, dynamic balance measurement using TUG obtained increased dynamic balance from T1: 14.90. After being given TENS, exercise therapy, and Kinesio tape increased to T3: 14.45. The result is still in the light fall risk value category, but there is an improvement in dynamic balance.

Discussion

Based on research conducted by Thakral et al.[4],TENS was provided with a flow of <35 mA frequency of 20 Hz for 15 minutes 3 times a week. The study explained that TENS was beneficial in the case of diabetic peripheral neuropathy. TENS increase of vascular endothelial growth factors, which were primary angiogenic factors. Angiogenic enhancement could improve microcirculation associated with neuropathy, reduce symptoms and improve neural function. With the increase in angiogenic, it can improve nerve function to reduce Paraesthesia in diabetic peripheral neuropathy.

In this article, the patient was also given exercise therapy. Exercise therapy plays a role in restoring peripheral nerve function by inhibiting aldose reductasefrom saving NADPH, which then plays a role in the synthesis of nitric oxide, which decreases hypoxia.The decrease in hypoxia will be sufficient to meet the need for oxygen levels in cells and tissues, reducing Paraesthesia. The exercises provided were pumping action, muscle strengthening, and balance exercises[3]. Strengthening

exercises play a role in strengthening muscles so that they will improve balance and improve gait. With increased balance, it will lower the fall risk in diabetic peripheral neuropathy[5]

In addition, patients were also given Kinesio tape. As is known in diabetic peripheral neuropathy, there is a lack of oxygen and nutrient intake in nerve cells caused by high blood sugar levels, so blood circulation is disrupted. The installation of Kinesio tape on diabetic peripheral neuropathy attracts the skin to give space to blood vessels to facilitate blood circulation. In addition, the application of Kinesio tape also provided sensorimotor stimulation. That could increase proprioceptive to improve balance to avoid the risk of falls in diabetic peripheral neuropathy[7].

Conclusion

After being given therapy in Diabetic Peripheral Neuropathy, as much as three times using Transcutaneous Electrical Nerve Stimulation, Exercise Therapy and Kinesio Tape obtained decreased Paraesthesia, increased muscle strength in the lower extremities and postural, and improved static and dynamic balance.

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