



Comparative Analysis of Different Treatment Duration of Transcutaneous Electrical Nerve Stimulation in the Management of Osteoarthritis Knee Pain

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Abstract

The purpose of this study was to comparative analysis of different treatment duration of transcutaneous electrical nerve stimulation in the management of osteoarthritis knee pain. For this purpose thirty (N=30) Osteoarthritis Knee patients were selected from Annamalai Nagar as subjects. Based on the treatment duration the group was divided into three groups of ten each, group-I was treated with TENS for 15 Minutes Duration, group-II was treated with TENS for 30 Minutes Duration and group-III was treated with TENS for 45 Minutes Duration. All the three groups were treated for a period of ten days. Pain was measured before and after the treatment through numerical pain rating scale. The data obtained from the experimental groups before and after the treatment period were statistically analyzed with dependent 't'-test and Analysis of covariance (ANCOVA). Whenever the 'F' ratio for adjusted post-test means was found to be significant, the Scheffe's test was applied as post-hoc test to determine the paired mean differences. The level of confidence was fixed at 0.05 level for all the cases. The results of the study found all the three treatment groups such as 15 minutes, 30 minutes, and 45 minutes duration of TENS are effective in pain relief. But the patient who received 45 minutes of TENS showed better relief then patients who received 15 minutes and 30 minutes of TENS.

Key words: Transcutaneous Electrical Nerve Stimulation, Osteoarthritis Knee Pain.

Introduction

Osteoarthritis (OA) is a common, painful, and limiting condition that affects an estimated many million around the world. Identification of effective non-pharmacologic strategies is critical for control of OA pain because of the increased intake of medications in older adults with this condition and recent concerns regarding COX inhibitors. Transcutaneous electrical nerve stimulation (TENS) is effective for pain relief in patients with OA and may be particularly effective for the knee. However, more standardized treatment protocols, stimulation parameters, and outcome measures are needed. Studies in animals with arthritis of the knee show that low and high frequency TENS has no effect on spontaneous pain behaviors but reduces hyperalgeisa (increased pain in response to noxious stimuli). (Barbar 2018).



Osteoarthritis is a disease that affects one's joints. The surfaces within one's joints become damaged so the joint doesn't move as smoothly as it should. The condition is sometimes called arthrosis, osteoarthrosis, degenerative joint disease or wear and tear. When a joint develops osteoarthritis, some of the cartilage covering the ends of the bones gradually roughens and becomes thin. This can happen over the main surface of your knee joint and in the cartilage underneath your kneecap. The bone underneath the cartilage reacts by growing thicker and becoming broader. All the tissues within the joint become more active than normal – as if your body is trying to repair the damage (*Lane and Nevitt, 1994*).

The main symptoms of osteoarthritis are pain and sometimes stiffness, which can affect one or both knees. The pain tends to be worse when one moves the joint or at the end of the day. One may have pain all around their knee or just in a particular place, most likely at the front and sides, and it may be worse after a particular movement, such as going up or down stairs. The pain is usually better when one rests.

A torn meniscus is a common injury in footballers, and an operation to remove the damaged cartilage (meniscectomy) or repair cruciate ligaments also increases the risk of osteoarthritis in later life. Genetic factors – Genetic factors play a major part in osteoarthritis of the knee. If one has a parent, brother or sister with knee osteoarthritis then they will have a greater chance of developing it oneself. We don't know a lot about the genes that cause the increased risk, but we do know that a number of genes will have a small effect rather than one particular gene being responsible (*Ruddy et al., 2001*).

TENS uses sticky electrode patches attached to a small, battery-operated device. It sends an electric current to your nerves to override pain signals. Another way TENS may relieve pain is by triggering the release of natural painkillers (endorphins) in the brain. TENS can be delivered at low frequency (l-TENS) or high frequency (h-TENS).

Material and Methods

For this purpose thirty (N=30) Osteoarthritis Knee patients were selected from Annamalai Nagar as subjects. Based on the treatment duration the group was divided into three groups of ten each, group-I was treated with TENS for 15 Minutes Duration, group-II was treated with TENS for 30 Minutes Duration and group-III was treated with TENS for 45 Minutes Duration. All the three groups were treated for a period of ten days. Pain was measured before and after the treatment through numerical pain rating scale.

The data obtained from the experimental groups before and after the treatment period were statistically analyzed with dependent 't'-test and Analysis of covariance (ANCOVA). Whenever the 'F' ratio for adjusted post-test means was found to be significant, the Scheffe's test was applied as post-hoc test to determine the paired mean differences. The level of confidence was fixed at 0.05 level for all the cases. The results of the study found all the three treatment groups such as 15 minutes, 30 minutes, and 45 minutes duration of TENS are effective in pain relief. But the patient who received 45 minutes of TENS showed better relief than patients who received 15 minutes and 30 minutes of TENS.



Analysis of the Data

The analysis of dependent 't'-test on the data obtained for Osteoarthritis Knee Pain of the subjects in the Pre-test and Post-test of three treatment group have been presented in Table - 1.

Table -1
The Summary of Mean and Dependent 't' test for the pre and post tests on Osteoarthritis Knee Pain of Three Treatment Groups

Mean	TENS for 15 Minutes Duration group -I	TENS for 30 Minutes Duration group - II	TENS for 45 Minutes Duration group - III
Pre- Test mean	7.00	7.20	7.70
Post-Test mean	5.00	4.70	4.30
't'-Test	14.74	7.62*	12.95*

* Significant at 0.05 level.

(Table value required for significance at .05 level for 't'-test with df 9 is 1.83)

From table-1 it is learnt that the dependent 't' test values between the pre and post test means of TENS for 15 Minutes Duration group, TENS for 30 Minutes Duration group and TENS for 45 Minutes Duration group is 14.74, 7.62 and 12.95 respectively. Since the obtained 't'-test value of experimental groups are greater than the table value 1.83 with df 9 at 0.05 level of confidence, it is concluded that TENS for 15 Minutes Duration group, TENS for 30 Minutes Duration group and TENS for 45 Minutes Duration group has registered significant improvement in performance of Osteoarthritis Knee Pain.



The Analysis of covariance (ANCOVA) on Osteoarthritis Knee Pain of three treatment group has been presented in Table -2.

Table – 2
Values of Analysis of Covariance on Osteoarthritis Knee Pain for
Three Treatment Groups

Adjusted Post test Means			Source of Variance	Sum of Squares	df	Mean Squares	'F' Ratio
TENS for 15 Minutes Duration group –I	TENS for 30 Minutes Duration group – II	TENS for 45 Minutes Duration group – III					
5.27	4.79	3.94	Between	7.74	2	3.87	14.80*
			With in	6.79	26	0.26	

* Significant at. 0.05 level of confidence

(Osteoarthritis Knee Pain Scores in Seconds)

(The Table value required for Significance at 0.05 level with df 2 and 26 is 3.37)

Table- 2 shows that the adjusted post test mean value of Osteoarthritis Knee Pain for TENS for 15 Minutes Duration group, TENS for 30 Minutes Duration group and TENS for 45 Minutes Duration group is 5.27, 4.79 and 3.94 respectively. The obtained F-ratio of 14.80 for the adjusted post test mean is more than the table value of 3.37 for df 2 and 26 required for significance at 0.05 level of confidence.

The results of the study indicate that there are significant differences among the adjusted post test means of three treatment groups on the decrease of Osteoarthritis Knee Pain.

To determine which of the paired means had a significant difference, Scheffe's test was applied as Post hoc test and the results are presented in Table-3.



Table – 3
The Scheffe's test for the differences between the adjusted post tests
paired means on Osteoarthritis Knee Pain

Adjusted Post Test Mean			Mean Difference	Confident Interval Value
TENS for 15 Minutes Duration group – I	TENS for 30 Minutes Duration group – II	TENS for 45 Minutes Duration group – III		
5.27	4.79	---	0.48*	0.18
5.27	---	3.94	1.33*	
---	4.79	3.94	0.85*	

*** Significant at .05 level of confidence**

Table - 3 shows that the adjusted post test means differences on TENS for 15 Minutes Duration group and TENS for 30 Minutes Duration group, TENS for 15 Minutes Duration group and TENS for 45 Minutes Duration group, and TENS for 30 Minutes Duration group and TENS for 45 Minutes Duration group are 0.48, 1.33 and 0.85 respectively and they are greater than the confidence interval value 0.18, which shows significant differences at 0.05 level of confidence.

The results of the study further have revealed that there is a significant difference in Osteoarthritis Knee Pain between the adjusted post test means of TENS for 15 Minutes Duration group and TENS for 30 Minutes Duration group, TENS for 15 Minutes Duration group and TENS for 45 Minutes Duration group, and TENS for 30 Minutes Duration group and TENS for 45 Minutes Duration group.

However, the improvement in Osteoarthritis Knee Pain was significantly higher for TENS for 45 Minutes Duration group than TENS for 15 Minutes Duration group and TENS for 30 Minutes Duration group. It may be concluded that the TENS for 15 Minutes Duration group has exhibited better than the TENS for 15 Minutes Duration group and TENS for 30 Minutes Duration group in decreasing Osteoarthritis Knee Pain.

The pre and post test mean values of TENS for 15 Minutes Duration group, TENS for 30 Minutes Duration group and TENS for 45 Minutes Duration group on Osteoarthritis Knee Pain are graphically represented in the Figure -1.

The adjusted post test mean values of TENS for 15 Minutes Duration group, TENS for 30 Minutes Duration group and TENS for 45 Minutes Duration group on Osteoarthritis Knee Pain are graphically represented in the Figure -2.

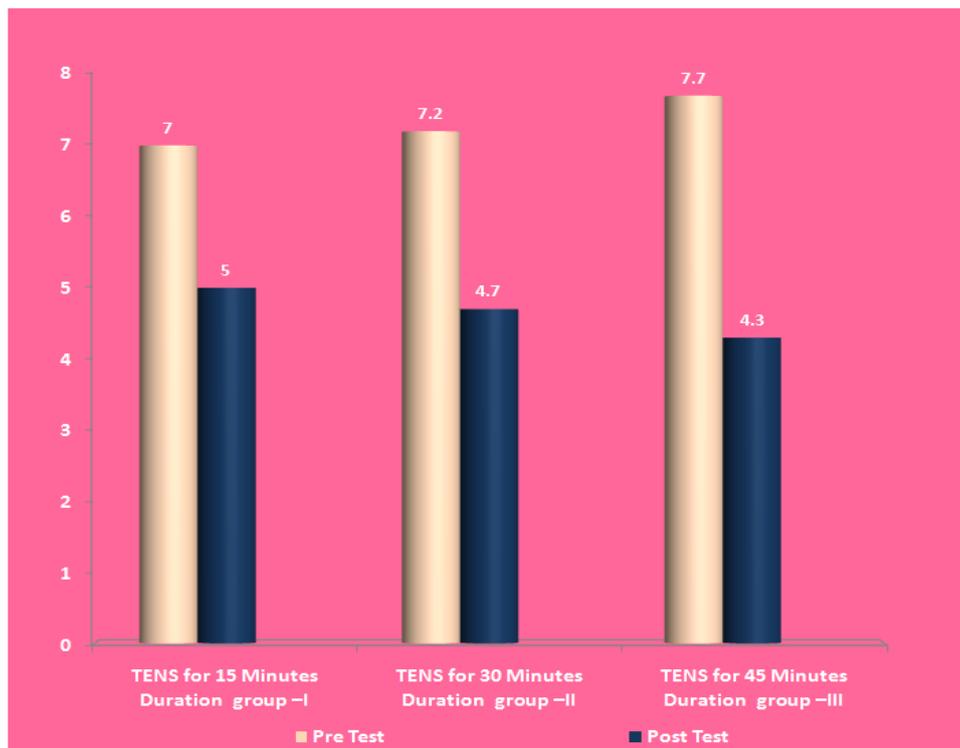


Figure- 1: The Pre and Post Test Mean values of TENS for 15 Minutes Duration group, TENS for 30 Minutes Duration group and TENS for 45 Minutes Duration group on Osteoarthritis Knee Pain

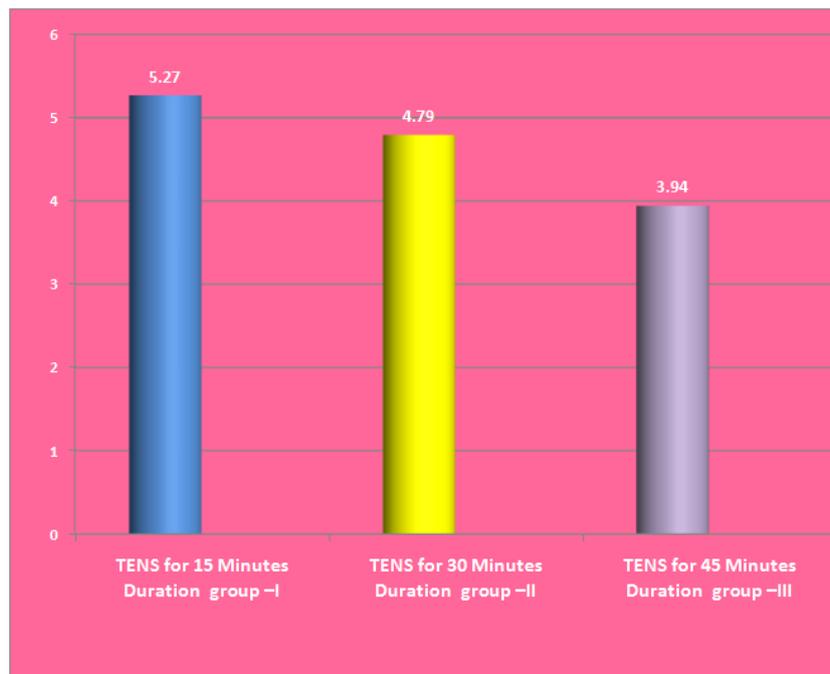


Figure: 2 The Adjusted Post Test Mean values of TENS for 15 Minutes Duration group, TENS for 30 Minutes Duration group and TENS for 45 Minutes Duration group on Osteoarthritis Knee Pain

Conclusion

The results of the study found all the three treatment groups such as TENS for 15 Minutes Duration group, TENS for 30 Minutes Duration group and TENS for 45 Minutes Duration group are effective in Osteoarthritis Knee Pain relief. But the patient who received 45 minutes of TENS showed better relief than patients who received 15 minutes and 30 minutes of TENS.

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