

## “A COMPARITIVE STUDY BETWEEN THE EFFECTIVENESS OF LOW TENS AND HIGH TENS IN OSTEOARTHRITIS OF TIBIOFEMORAL”



### Physiotherapy

**KEYWORDS:** Osteoarthritis, TENS,VAS, Lysholm's knee scoring scale.WOMAC osteoarthritis index.

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### ABSTRACT

**Background:** Osteoarthritis is a degenerative disorder of synovial joints characterised by focal loss of articular cartilage with reactive changes in sub- chondral, marginal bone and synovial. Pain is the usual presenting symptom, though starts insidiously it increases slowly over months or years. It is aggravated by exertion and relieved by rest, it is worst at night when patient is in bed. Pain in osteoarthritis occurs due to stretching of fibrosed part of capsule muscular fatigue increase in bone pressure due to vascular congestion and intraosseous hypertension. Since till date there is no curative treatment for osteoarthritis, the primary goal for osteoarthritis are to relieve pain, maintain or improve functional status and minimize deformity. Study objective:Implementation of high TENS and low TENS for each group of patients with unilateral tibiofemoral osteoarthritis. Methodology: All the subjects who were diagnosed to have idiopathic, mild to moderate unilateral involvement of tibiofemoral osteoarthritis were selected based on the inclusion and exclusion criteria of the study. The subjects were randomly divided into groups. Group A (Low TENS group); received frequency of 8 Hz, pulse width 0.5 ms, intensity up to patients tolerance for 20 minutes twice daily. Group B (high TENS); received frequency of 100 Hz, pulse width 0.5 ms, intensity upto patients perception duration for 20 minutes twice daily. Both the group patients were asked to do exercises like isometric quadriceps, short arch terminal knee extension, strengthening exercises for quadriceps and hamstrings. Results and Discussion: This study is carried out to evaluate and compare the effect of high versus low TENS, the analysis of data collected reveals that there is not much significant change between the applications of high or low TENS with regard to the outcome. The analysis reveals that low TENS produces a greater average improvement with regard to pain but responds lesser to increase in functional abilities and ROM in patients with osteoarthritis. The high TENS produces greater improvement in functional capacities and ROM, the improvements are not consistent with staggeringly high standard deviation.

### INTRODUCTION

Osteoarthritis is a degenerative disorder of synovial joints characterised by focal loss of articular cartilage with reactive changes in subchondral, marginal bone and synovium.(1)

Depending on the course of onset it's classified as primary osteoarthritis and secondary osteoarthritis.(2) Osteoarthritis is most common in knee joints; it can be identified in 35% of the knees of people as early as age 40 in Indian population.

Since there is a poor degree of interlocking in the surfaces and torsional stress over a weight bearing joint makes the knee joint most vulnerable to degenerative changes as the replacement cannot keep pace with wear and tear.(3)

The articular cartilage is 2 to 4 mm thick highly specialized tissue precisely suited to withstand rigorous joint environment with failing.

The articular cartilage has two main functions,

- To distribute joint load over wide area.
- To allow reactive movements to oppose joint surface with minimum friction and wear.(4)

Histologically the articular cartilage is composed on chondrocytes which account for 10 % of tissue volume, chondrocytes manufacture, secrete and maintain the organic component of extra cellular matrix.

The matrix also contains collagen and proteoglycans, collagen in articular cartilage is non-homogenously distributed, and there are 3 separate structural zones. A superficial tangential zone (which constitutes 10 to 20% of total thickness: the fibres' are packed and run parallel to the articular surface). A middle zone (constitutes 40 to 60% of total thickness where fibres are dispersed and randomly oriented).

A deep zone (constitutes 30 % of total thickness, consists of radically oriented fibres).(4)

Proteoglycans are large protein polysaccharides which are rich in keratin sulphate, oligosaccharides and chondroitin sulphate. Water is abundant component of articular cartilage which is around 65 to 80%, it consists of sodium and calcium ions.(4)

Biomechanically articular cartilage shows properties of viscoelasticity, it responds to constant loading (creep) by allowing the flow of interstitial fluid.

Wear of articular cartilage occurs due to Interfacial wear mainly due to the interaction of weight bearing surfaces.Fatigue wear due to accumulation of microscopic damage within the weight bearing material under repetitive stress.

Pain is the usual presenting symptom, though starts insidiously it increases slowly over months or years. It is aggravated by exertion and relieved by rest, it is worst at night when patient is in bed. Pain in osteoarthritis occurs due to stretching of fibrosed part of capsule,muscular fatigue and increase in bone pressure due to vascular congestion and intraosseous hypertension.Since till date there is no curative treatment for osteoarthritis, the primary goal for osteoarthritis are to relieve pain, maintain or improve functional status and minimize deformity.(2)

### Objectives

1. To assess the pain level of the patients with unilateral tibiofemoral osteoarthritis.
2. Implementation of high TENS and low TENS for each group of patients with unilateral tibiofemoral osteoarthritis.
3. To re-evaluate the pain level of patients after TENS application.

**Materials and Methods**

Inclusion criteria;All the patients irrespective of gender, with above 45 years age group were selected for study. The patients were primarily diagnosed and evaluated by orthopaedic surgeon and referred to physiotherapy department.

All the subjects who were diagnosed to have idiopathic, mild to moderate unilateral involvement of tibiofemoral osteoarthritis were selected based on symptoms like pain in the medial joint line, crepitation ofknee joint, swelling ofknee joint, functional limitation. Exclusion criteria;Recent fractures around the knee, Ligament injuryMeniscal injury, Surgeries around the knee, severe osteoarthritis as determined by kellgren and Lawrence criteria, knee deformities, patello femoral osteoarthritis., systemic disfunction and disorders were TENS was contraindicated

**Outcome measures;**

- Assessment chart
- Visual analogue scale
- Lysholm's knee scoring scale
- WOMAC osteoarthritis index

**Materials:** Transcutaneous electrical nerve stimulator.Goniometer, Inch tape,Weighing scale

**Study Design:** Experimental pre-test- post-test study design.

**Sample Size:** 18 patients were selected on the basis of inclusion and exclusion criteria. They were divided into two groups of nine each. Sampling Method: Random block sampling method was used.

**Techniques**

**GROUP A (low TENS group)**

Received frequency of 8 Hz, pulse width 0.5 ms, intensity up to patient's tolerance for 20 minutes twice daily for 4 weeks.

**GROUP B (high TENS)**

Received frequency of 100 Hz, pulse width 0.5 ms, intensity upto patient's perception duration for 20 minutes twice daily for 4 weeks. Both the group patients were asked to do exercises like isometric quadriceps, short arch terminal knee extension, strengthening exercises for quadriceps and hamstrings.

**Table 1: visual analogue scale between group A (low TENS) and Group B (high TENS)**

GROUP A(LOW TENS)			GROUP B(HIGH TENS)		
Pre	Post	diff	pre	Post	diff
8	4	-4	6.5	4.1	-2.4
7.5	4	-3.5	7.4	5.5	-1.9
5.6	3.5	-2.1	8	5	-3
7.1	4	-3.1	7.1	5.3	-1.8
4.8	2.5	-2.3	8.2	5.1	-3.1
6.3	4.2	-2.1	5	2.4	-2.6
5.5	3.6	-1.9	7.6	5.3	-2.3
7.6	5.3	-2.3	3.5	1	-2.5
6.9	4.5	-2.4	8	5.6	-2.4
AVERAGE		-2.63333			-2.44444
S.D		0.726292			0.433333
Diff of mean (x1-x2)		0.188889			
S=		0.588257			
Group A item		9			
Group B item		9			
Factor		2.12132			
T=	0.681155				

**TABLE 2: analysis of changes in WOMAC scale**

GROUP A(LOW TENS)			GROUP B(HIGH TENS)		
Pre	Post	Diff	Pre	Post	diff
124.2	119.5	-4.7	155.6	146.4	-9.2
152.4	144.6	-7.8	152.4	143.2	-9.2
149.8	143.2	-6.6	162.7	150.4	-12.3
136.1	126.2	-9.9	172.3	161.8	-10.5
159.2	152.2	-7	185	169.8	-15.6
126.5	121.6	-4.9	132.4	113.9	-18.5
159.7	157.2	-2.5	139.6	134	-5.6
172.6	167	-5.6	161	153.1	-7.9
128.1	125.3	-2.8	119.5	109	-10.5
Average		-5.75556			-11.0333
S.D		2.367019			3.950316
Diff of mean (x1-x2)		5.277778			
S=		4.165753			
Group A items		9			
Group B items		9			
Factor		2.12132			
t=		2.687595			

**TABLE 3: variations in ROM**

GROUP A(LOW TENS)			GROUP B(HIGH TENS)		
Pre	Post	Diff	Pre	Post	diff
120	125	5	110	120	10
110	115	5	115	120	5
100	105	5	95	85	-10
105	105	0	100	115	15
115	125	10	115	120	5
95	100	5	90	110	20
95	105	10	100	110	10
105	110	5	90	105	15
115	120	5	100	115	15
Average		5.555556			9.444444
S.D		3.004626			8.819171
Diff of mean (x1-x2)		3.88889			
S=		6.697234			
Group A items		9			
Group B items		9			
Factor		2.12132			
t=		1.23179			

**TABLE 4: analysis of Lysholm's scale**

GROUP A(LOW TENS)			GROUP B(HIGH TENS)		
Pre	Post	Diff	Pre	Post	diff
23	32	9	9	19	10
37	44	7	29	37	8
32	38	6	30	41	11
12	20	8	24	33	9
25	32	7	15	23	8
18	26	8	46	54	8
35	44	9	21	28	7
31	37	6	12	22	10
10	15	5	18	26	8
Average		7.222222			8.777778
S.D		1.394433			1.301708

Diff of mean (x1-x2)	1.55556			
S=	1.53393			
Group A items	9			
Group B items	9			
Factor	2.12132			
t=	2.15123			

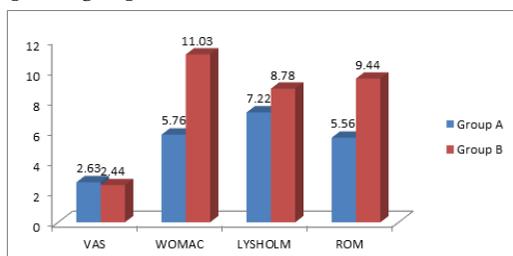
**Table 5: mean improvements of various parameters after application of high and low TENS**

PARAMETERS	Group A(low TENS)	Group B(high TENS)	t-values
VAS	2.63	2.44	0.681155
WOMAC	5.76	11.03	2.687595
LYSHOLMS	7.22	8.78	2.151
ROM	5.56	9.44	1.23179

't' values for 16 d.f is **1.746**

**N.B:P=0.05**

**Graph 1; Mean improvements of various parameters between group A and group B.**



## DISCUSSION

TENS is an electrical modality, which has been proved to be effective in pain relief. The mode of action for pain relief is mainly through pain gate theory and descending pain suppression system. The most common type of TENS used is low TENS and high TENS. This current is presumed to selectively stimulate the large low threshold A beta fibres to produce inhibition of pain gate mechanism. The low TENS on other hand stimulates the C fibres and helps in release of endorphin and enkephalin which inhibits pain pathway in the dorsal horn of spinal cord. (5&6)

This study is carried out to evaluate and compare the effect of high verses low TENS, the analysis of data collected reveals that there is not much significant change between the applications of high or low TENS with regard to the outcome. The analysis reveals that low TENS produces a greater average improvement with regard to pain but responds lesser to increase in functional abilities and ROM in patients with osteoarthritis. The high TENS produces greater improvement in functional capacities and ROM, the improvements are not consistent with staggeringly high standard deviation. On the contrary low TENS, though produced lesser improvement has consistent changes. The t value calculated are significant for functional scales alone at  $p=0.05$ . hence it has to be concluded that there is no significant difference between high TENS and low TENS with regard to pain relief and functional improvement in patients with osteoarthritis.

## CONCLUSION

The analysis of data reveals that there is decrease in pain in both the groups. When comparison was done between the groups, there was no significant difference in the outcome with application of low or high TENS. However, on functional scale parameters were improved in group B, which received high TENS. This effect may be due to the high sensory level stimulation caused by high TENS.

## LIMITATIONS

1. Lack of adequate and strict control in patients selection.
2. Long term effects of TENS not seen.
3. Less sample size.

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**Conflict of interest:** Nil.

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