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TO SEE THE EFFECT OF ELECTRICAL STIMULATION VERSUS CONVENTIONAL STATIC EXERCISE ON QUADRICEPS FEMORIS STRENGTH IN OA KNEE

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ABSTRACT:

Introduction

Osteoarthritis disease is the result of mechanical and biological events that destabilize the normal process of degradation and synthesis of articular cartilage chondrocytes, extra cellular Matrix, and subcondral bone. These changes include increased water content and altered collagen matrix all leading to the deterioration of articular cartilage. Osteoarthritis can be classified into primary and secondary types. Primary Osteoarthritis generally is a Poly Articular degenerative Arthritis of unknown origin that may be active to some extent in several joints and rarely occurs the age of 35 years. Secondary Osteoarthritis usually in non articular, in which the reaction of a joint to some condition has produced incongruity in its surfaces. Mechanical derangement, pyogenic infection, congenital anomaly Physical separation, ligamentous instability and fracture into a joint are among the common causes of secondary osteoarthritis.

Since very less study has been done on effects of isometric exercise and electrical stimulation on Osteoarthritis knee patient. So, the need exists to do a study to see the effect and also to determine which technique can be used effectively to increase the strength of quadriceps femoris in osteoarthritis knee patient (38)

Research design- Experimental study, different subject design.

Population- the number of subject participating in study will be 30. Male & female patient between ages 40 to 55 years were selected.

Result- V.A.S. score of control group A at day 0 was 6.46 ± 1.24 & at day 7 was 4.53 ± 1.06 & Day 15 was 2.93 ± .703. This shows that there was significant decrease in V.A.S. score that is there was significant decrease in pain. Similarly in the experimental group B at day 0 was 6.20 ± 1.14 & day 7 was 4.13 ±.915 & day 15 was 2.06 ± .703. That there is decrease in V.A.S. score that are there was significant decrease in pain. But on comparing group A & B mean & standard deviation values there is more significant improvement in pain in experimental group. M.M.T. finding of control group A at day 0 was 3.60 ± 507 & at day 7 was 4.33 ± .723 & Day 15 was 4.60 ± .507 this shows that there was significant increase in quadriceps femoris strength. Similarly in experimental group B at day 0 was 3.53 ± .516 & day 7 was 3.73 ± .457 & day 15 was 4.46 ± .516 that there was increased. Quadriceps femoris Strength. But on comparing group A & B mean and standard deviation values there is no significant at 0 day but on the 7th day there is much more increased in strength of quadriceps femoris & 15th day there is no significant in group A & B in strength of quadriceps femoris muscles.

Conclusion- there may not be significant improvement in strength of quadriceps femoris in osteoarthritis knee patients with electrical stimulation as compared to conventional static exercise, but there is significant improvement in the pain in experiment group than control group.

KEYWORDS:

RESPONSIBLE, RESPONSIBILITY, DUTY, LIABILITY, CARING, BLAME, REPORT, EXPLAIN.

INTRODUCTION

Osteoarthritis disease is the result of mechanical and biological events that destabilize the normal process of degradation and synthesis of articular cartilage chondrocytes, extra cellular Matrix, and subcondral bone. These changes include increased water content and altered collagen matrix all leading to the deterioration of articular cartilage.

Osteoarthritis can be classified into primary and secondary types. Primary Osteoarthritis generally is a Poly Articular degenerative Arthritis of unknown origin that may be active to some extent in several joints and rarely occurs the age of 35 years.

Secondary Osteoarthritis usually in non articular, in which the reaction of a joint to some condition has produced incongruity in its surfaces. Mechanical derangement, pyogenic infection, congenital anomaly Physical separation, ligamentous instability and fracture into a joint are among the common causes of secondary osteoarthritis. The prognosis is better for primary type, Polyarticular degenerative arthritis then for secondary type.

The end stage of both type may be of primary osteoarthritis is usually slower and less relentless. Primary osteoarthritis especially in weight bearing joints is more common is Obese patient over the age of 50 years .A no. of studies have shown an association of osteoarthritis of the hip with occupation requiring heavy lifting and elite sporting activities. However no such relationship has yet to shown between osteoarthritis on the knee and activity levels [1].Osteoarthritis of the knee joint is charactized by structure joint changes including joint space narrowing and osteophyte formation. [2] much of the disability associated with knee osteoarthritis is attributed to quadriceps weakness and pain rather than radiographic[3-4-5-6].Many risk factor and their association with knee osteoarthritis have been reported in several cross sectional and retro sepective study .well recognized factor associated with knee osteoarthritis included female preponderance and the effect of obesity and age[7]. Age is the greatest risk factor for osteoarthritis [8].In addition there is consistent evidence supporting the theory of an inverse relationship between bone density and osteoarthritis. Risk factor such as excessive physical activity in males ,a possible factors with as hypercholesterolemia, increased blood glucose level and hypertension [7].Individual with symptomatic knee osteoarthritis with radiographic evidence of osteoarthritis or asymptomatic knee osteoarthritis with severe radiographic change of large osteophytes[8]and joint spacing narrowing have increased risk for dependence in those activity of daily living which require the use of the lower extremity[9].The femorotibial joint and patellofemoral joint are the largest sites for osteoarthritis of the knee joint[10].Isolated patellofemoral osteoarthritis is relatively rare[11].The incidence of symptomatic patellofemoral osteoarthritis in patient older than 53 year has been estimated to be 8% of women and 2%of men[12].Eight percent have pain and difficulty during climbing stair[13]. Patellofemoral joint lesions have to be lateral in 89% of all patellofemoral joint lesion have to be lateral in 89% of all patellofemoral osteoarthritis[12].There is no permanent cure osteoarthritis thus conservative treatment aim is to reduce pain and limit functional impairment, in extensive intervention with minimal side effects are desirable[14].

ELECTRICAL STIMULATION

Laura inveracity electric stimulation is treatment modality that uses an electrical current to cause a single muscle or a group of muscles to contract. This contraction helps strength-injured muscles and promotes healing. Electrical stimulation is an electrical current to cause a single muscle or a group of muscle to contract by placing electrodes on the skin in various locations the appropriate muscle via electric stimulation helps strengthen the affected muscle and change the current setting to allow for a forceful or gentle muscle contraction[15]. Therapeutic electrical stimulation is characterized according to its waveform, amplitude, duration and frequency. Three basic type of waveform exist: direct current, alternative current and pulsed current. The pulse waveforms are the most common applied for therapeutic purposes. Pulsed wave can be further classified as monophasic or biphasic. [16-17] Electrical stimulation is widely used technique to improve muscle strength. Based on transcuatenous electrical stimulation of intramuscular motor fiber, strong enough to induce a contraction. it is generally accepted that electrical stimulation complement to traditional training for healthy subject and not a valid substitute of the latter because of pattern . Several studies have confirmed the efficacy of this method in orthopaedic rehabilitation, physical therapy and in the treatment of peripheral nervous system lesions , allowing reducing muscle atrophy, weakness and wasting [18-19]. However, great variability in the efficacy of electrical stimulation to increase muscular strength and sport performance [20-21]. In man clinical application of this modality has been shown to increase succinic dehydrogenase in the quadriceps of patients recovering from reconstructing surgery of anterior cruciate ligament [22].electrical stimulation has been used for many years as a treatment modality in the rehabilitation of injured muscle[23-24].To be effective in increasing strength an electrical must be capable of producing strong titanic muscular contraction and yet activate low pain response[25]. It is generally assumed that the characteristic of an electrical can be modified to minimize discomfort \ pain by altering the wave, form pulse duration and frequency [26-27].generally speaking electrical stimulation does not directly stimulate skeletal muscle. Electrical stimulation actually exits the motor nerve going to muscle and not muscle itself therefore high frequency stimulation (>70hz) will cause neuro-muscular junction failure and muscle rapidly fatigue [28-29].The optimal frequency is similar to the range of normal motor unit discharged frequencies generated during voluntary activity 20 -50 Hz[29-30].lower frequency cause unsafe muscle contraction[29].one common problem is pain during stimulation. Commercial stimulator provide many different forms and pulse setting capable of producing contraction at this therapeutic levels[31-32-33].Researcher have attempted to identify preferred stimulation setting in terms of comfort[33-34].force of contraction[32-35].and muscle fatigue defined as a decrease in the force generating ability of a muscle resulting from resent activation.[36-37]

AIMS AND OBJECTIVE

To study the effect of electrical stimulation and conventional static exercise in osteoarthritis knee in

(a) Increase in strength

(b) Relief of pain

Compare effectiveness of electric stimulation and conventional static exercise in osteoarthritis knee.

NEEDS OF THE STUDY

Since very less study has been done on effects of isometric exercise and electrical stimulation on Osteoarthritis knee patient. So, the need exists to do a study to see the effect and also to determine which technique can be used

effectively to increase the strength of quadriceps femoris in osteoarthritis knee patient [38]

SIGNIFICANCE OF STUDY

The electrical stimulation can be used beneficially in improving the strength of quadriceps femoris muscle in osteoarthritis knee patients and thus help in speeding up the recovery and functional status.

Limitation of the study

Small sample size

Duration of study is less

No long term follow up has been done

METHODOLOGY

RESEARCH DESIGN: Experimental study, different subject design.

POPULATION: the number of subject participating in study will be 30. Male & female patient between ages 40 to 55 years were selected.

SAMPLE DESIGN: subject are chosen according to convenient sampling method & divided into two groups A & B. Group A is control group & group B is experimental group.

SELECTION CRITERIA

INCLUSION CRITERIA

Knee pain as the primary complaint.

All referred patients as osteoarthritis knee from orthopaedician. (On basis of x- ray finding)

Age group 40-55 years of both sexes.

Knee pain present from last 6 month.

No current participation in lower limb strengthening program.

EXCLUSION CRITERIA

History of diabetes

Diagnosed tumors, infection.

Moderate to severe peripheral neuropathy.

Neurological vascular claudication.

Knee pain caused by bursitis.

Post traumatic knee stiffness.

Patellar fracture.

Postoperative knee cases

Distal femoral fracture

History of only patellofemoral joint dysfunction.

PROTOCOL

The total duration of the study is 2 weeks; the duration for each subject in-group A is 180sec per week, i.e.36 second per session, five days each week for 2 wks. (10 session) .the group B subject were treated for 10 session i.e. 5 Days each wks for two wks with rectangular (25pps). Intensity was adjusted according to each subject variable tolerance.[38]

PROCEDURES

Thirty patients of osteoarthritis participated in study. Both in group A and group B, 15 patients were taken. Group A and Group B subject were explained about the study and group A performed practice exercise in the test position. Exercises consist of the knee extensor static exercise and were followed by 10-second rest periods, 3 separate contractions were made by each subject during each of 2-practice session held on consecutive days. No measurements of strength were taken during this introductory phase. Following this introductory phase, both group A and group B subject were tested for quadriceps strength in short sitting position via manual muscle testing [88]. And pain assessment was done using VAS .scale All subjects grasped the side of test table with their hands during the test. [80] The test position has been validated previously. [81] A sustained maximum isometric contraction (6 second) by each subject were repeatedly encouraged verbally (by actually shouting) by the examiner. An electrical stimulator was used to provide the desired faradic electrical stimulation to the group B subjects. The active electrodes (cathode) were placed proximally over the femoral triangle and the dispersive electrode (anode) was placed distally over the quadriceps femoris muscle. [82] (5-7 cm proximal to the superior patellar border) each electrode consisted of cotton padded, lead plate (7.6*12.2 cm) soaked in a solution of sodium chloride to enhance the passage of current[83-84]Intensity were adjusted according to subject variable tolerance and controlled and by examiner. In each case a strong, sustained muscular contraction caused by electrical stimulation will be observed. Group A were composed of 15 subjects. Each member of group A performed six-second maximum isometric contractions of the knee extensors muscle with ten seconds of rest between each of the contraction. This routine were repeated during each of the 10 training sessions held from Monday to Friday for 2 weeks and for pain relief both group A & B given hot packs for 15 min. Subsequent measurements of strength by MMT and pain by VAS score was done on 7th day and 15th day of treatment intervention.

This chapter deals with the results of the data analysis. Paired sample t – test was used to compare the performance of the subjects on V.A.S. and M.M.T. at zero day, seventh day, fifteenth day.

TABLE – 5.1 ILLUSTRATES V.A.S. FINDING AT DAY 0, DAY 7, DAY 15,

Descriptive Statistics				
		GROUP		
		A	B	Total
Mean	VAS0	6.4667	6.2000	6.2000
	VAS7	4.5333	4.1333	4.1333
	VAS15	2.9333	2.0667	2.0667

Std. Deviation	VAS0	1.24595	1.14642	1.14642
	VAS7	1.06010	.91548	.91548
	VAS15	.70373	.70373	.70373
N	VAS0	15	15	15
	VAS7	15	15	15
	VAS15	15	15	15

As shows by table 5.1. V.A.S., score of control Group A at day 0 was 6.46 ± 1.24 & at day 7 was 4.53 ± 1.06 & Day 15 was 2.93 ± .703.

The experimental group B as shown by V.A.S. score at day 0 was 6.20 ± 1.14 & day 7 was 4.13 ±.915 & day 15 was 2.06 ± .703.

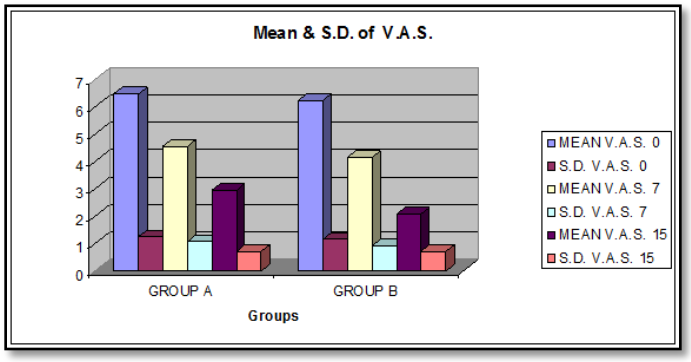

FIGURE 5.1 – ILLUSTRATES MEAN & STANDARD DEVIATION OF V.A.S.

TABLE – 5.2 ILLUSTRATES M.M.T. FINDING AT DAY 0, DAY 7, DAY 15

Descriptive Statistics				
		GROUP		
		A	B	Total
Mean	MMT0	3.6000	3.5333	3.5333
	MMT7	4.3333	3.7333	3.7333
	MMT15	4.6000	4.4667	4.4667
Std. Deviation	MMT0	.50709	.51640	.51640
	MMT7	.72375	.45774	.45774
	MMT15	.50709	.51640	.51640
N	MMT0	15	15	15
	MMT7	15	15	15
	MMT15	15	15	15

As shows by table 5.2. M.M.T.., finding of control Group A at day 0 was 3.60 ± .507 & at day 7 was 4.33 ± .723 & Day 15 was 4.60 ± .507.

The experimental group B as shown by M.M.T. finding at day 0 was 3.53 ± .516 & day 7 was 3.73 ± .457 & day 15 was 4.46 ± .516.

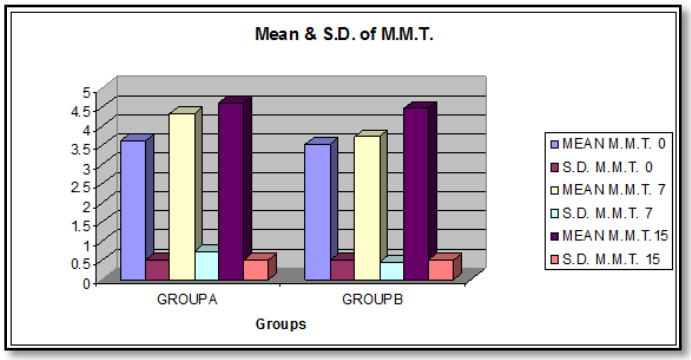

FIGURE 5.2 – ILLUSTRATES MEAN & STANDARD DEVIATION OF M.M.T.

TABLE – 5.3 ILLUSTRATES COMPARISON BETWEEN GROUP A AND GROUP B

VARIABLE	t value	p value
VAS 0	0.61	0.547
VAS 7	1.106	0.278
VAS 15	3.373	0.002**
MMT 0	3.373	0.002
MMT 7	0.357	0.724
MMT 15	0.714	0.481

** Significant at .002 levels

DISSCUSION

As shown by table 5.1 V.A.S. score of control group A at day 0 was 6.46 ± 1.24 & at day 7 was 4.53 ± 1.06 & Day 15 was 2.93 ± .703.This shows that there was significant decrease in V.A.S. score that is there was significant decrease in pain. Similarly in the experimental group B at day 0 was 6.20 ± 1.14 & day 7 was 4.13 ±.915 & day 15 was 2.06 ± .703.That there is decrease in V.A.S. score that is there was significant decrease in pain. But on comparing group A & B mean & slandered deviation values there is more significant improvement in pain in experimental group.

As shown by table 5.2 M.M.T. finding of control group A at day 0 was 3.60 ± .507 & at day 7 was 4.33 ± .723 & Day 15 was 4.60 ± .507this shows that there was significant increase in quadriceps femoris strength. Similarly in experimental group B at day 0 was 3.53 ± .516 & day 7 was 3.73 ± .457 & day 15 was 4.46 ± .516 that there was increased .Quadriceps femoris Strength. But on comparing group A & B mean and slandered deviation values there is no significant at 0 day but on the 7th day there is much more increased in strength of quadriceps femoris & 15th day there is no significant in group A & B in strength of quadriceps femoris muscles.

This is great number of personal and social consequences of osteoarthritis. In osteoarthritis the knee joint is the

most commonly associated with clinical symptoms and disability [85].

Pain and disability are apparent in almost half of the patients with radiographic disease [3].

As indicated by the previous studies there are no permanent conservative cure for the knee osteoarthritis.

So the study was done to see the effect of electrical stimulation and conventional static exercise on strength of quadriceps femoris muscle in osteoarthritis knee.

As it was found by Durmus D, Alayli G, (2006) that electrical stimulation treatment was as effective as exercise in knee osteoarthritis and electrical stimulation treatment can be suggested specially for the patients who have difficulty in or contraindicated to perform an exercise programme [52].

Dean P, Currier et.at. In (1979) that electrical stimulation combined with maximum isometric contractions of the quadriceps femoris muscle has no greater effect on enhancing muscular strength than doe's conventional static exercise on healthy subjects [38].

John A. Romoero et.al. (1982) study indicated that faradic electrical stimulation can produce a significant increase in isometrics strength and perhaps strength at slow speed of motion in young untreated females. [56]

It has been found in the study done by Laughman RK and youndas JW et. al. (1983) that electrical stimulation causes increase in quadriceps femoris muscle torque when compared with the non- exercised controls and that electrical stimulator is an appropriate device for strengthening skeletal muscle without voluntary efforts[54].

In one of the study done by Kristin R. Bajer et. al. (2003) found that the weakness of quadriceps is most commonly associated with knee osteoarthritis [86].

Our result is supported by this study compare the dynamic versus isometrics resistance training programs with thera band elastic bands to the patients with osteoarthritis of the knee to enhance functional ability and to reduce their knee joint pain.[75]

Mohr T and Carison et. al. (1985) found that high volt galvanic current stimulation is not as effective as isometric exercise in increasing strength in muscles [59].

As it has been found by Caggaino E and Emery T. et. al. (1994) found that electrical stimulation has the same potential as traditional exercise to provide improved strength for aged males [58]. Selkowitz DM (1985) found that increases in isometric strength of quadriceps of femoris muscle; training isometrically with electrical stimulation produced a significantly greater increase than not training with electrical stimulation [53].

Talbot LA, Gaines JM, et. al. (2003) concluded a home based neuro muscular electrical stimulation protocol appears to be a promising therapy for increasing quadriceps. Strength in adults with knee osteoarthritis without exacerbating painful symptoms [57]

Through this present study it is clear that there is significant improvement in pain in experimental group than control group and there is no significant improvement on the strength of quadriceps femoris muscles.

CONCLUSION

The finding of the study supports that there may not be significant improvement in strength of quadriceps femoris in osteoarthritis knee patients with electrical stimulation as compared to conventional static exercise, but there is significant improvement in the pain in experiment group than control group.

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