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A COMPARATIVE STUDY ON EFFICACY OF NEURAL MOBILIZATION AND LASER ON PAIN AND FUNCTIONAL ACTIVITY OF LOWER LIMB IN SUBJECTS WITH PIRIFORMIS SYNDROME.

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ABSTRACT:

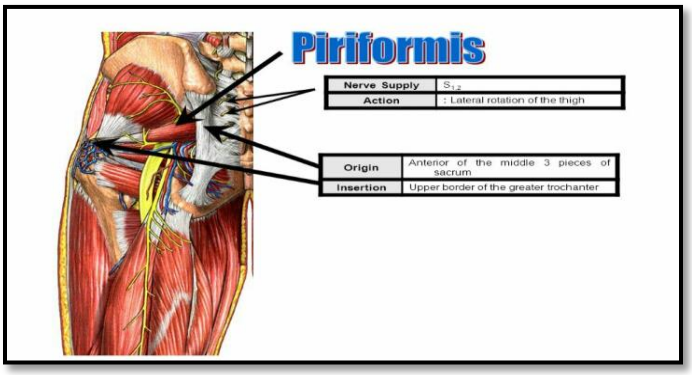
Piriformis syndrome is a neuromuscular disorder. It defined as a peripheral neuritis of sciatic nerve. It is a condition which is believed to result from compression of sciatic nerve around the piriformis. Focus of this study is to compare the efficacy of neural mobilization and laser on pain and functional activity of lower limb in subjects with piriformis syndrome. The sample consisted of 30 subjects, from both sexes, ranging from 25 to 50-years-old. Parameters are the Visual Analogue Scale (VAS) and lower extremity functional scale (LEFS). An experimental design was used in this study. 15 subjects were assigned to a experimental group; received 10 sessions of neural mobilization & LASER, while a second group of 15 subjects were assigned as control group; received 10 sessions of only LASER for five sessions per week, in two weeks. All participants were assessed for post values with VAS and LEFS after 2 weeks of training sessions. After the analysis, the results revealed significant improvement in VAS and LEFS in both the groups ($p < 0.001$) for pain intensity and functional status. But, experimental group improved statistically significant. In this study concluded that the enhanced functional activity by neural mobilization and laser can account for the improvement in the physical status of the subject along with diminished pain. Certainly the neural mobilization and laser combination has positively affected the functional status of the subjects.

KEYWORDS:

NEURAL MOBILIZATIONS, PIRIFORMIS SYNDROME, LASER.

INTRODUCTION

Piriformis syndrome is a neuromuscular disorder that occurs when the sciatic nerve is compressed or irritated by the piriformis muscle causing pain, tingling and numbness in the buttocks and along the sciatic nerve[1,2]. There are two types of piriformis syndromes. Primary piriformis syndrome and Secondary piriformis syndrome. Primary piriformis syndrome is caused by an anatomic cause, such as a split piriformis muscle, split sciatic nerve, or an anomalous sciatic nerve path. Secondary piriformis syndrome is the result of a precipitating cause such as a macrotrauma, microtrauma, ischemic mass effect or local ischemia[3,2]. The piriformis muscle is a flat, band like muscle, it is located in the buttocks near the top of the hip joint.



Symptoms associated with piriformis syndrome typically consists of buttock pain that radiates into the hip, numbness, paraesthesia of entire lower limb[1,2]. There may be aggravation of pain with activities that increase the tension of piriformis like prolonged sitting, walking, squatting, hip adduction and internal rotation[1].

A number of systematic reviews have shown that neural mobilizations have an effect on pathologies relating to nervous system. Neural mobilizations has been demonstrated to produce mechanical effects in terms of nerve strain and excursion and has been one of the theoretically established modes of therapy for piriformis syndrome. There are different methods of delivering neural mobilizations, including “sliding” and “tensioning” techniques[4,5]. Sliding techniques involve combinations of movements that result in elongation of the nerve bed at one joint, while reducing the length of the nerve bed at an adjacent joint[6,7]. These techniques are suggested to be less aggressive in nature compared to tensioning techniques, which involve increasing the distance between each end of the nerve bed via elongation[5]. It has been demonstrated that these techniques exert different biomechanical effects on the nervous system. Sliding techniques have been theorized to play a role in the dispersion of inflammatory products and limiting fibroblastic activity. Tensioning techniques have been suggested to play a role in reducing intra neural swelling and circulatory stasis by altering intraneural pressure associated with these techniques.

LASER is abbreviation for light amplification by stimulated

emission and radiation. Laser is a form of light energy. The three unique properties or highlights of LASER are Monochromatic, Directional and Coherent. Hence LASER is used in large number of applications. LLLT is abbreviation for low level laser therapy. When low energy of LASER light of specific wave length (635-904nanometers) is irradiated on the body the energy is observed by the cells in the local area. This process is called **Bio-Stimulation.** LLLT promoted proliferation, migration and adhesion of the cells and counters Apoptosis (death of cell). Thus LLLT has proved to be very effective in wound healing, pain relief and inflammation reduction. Advantages of using LLLT is Non invasive, Sterile and no side effects- The effect of LLLT irradiation is felt only on the localized area of treatment[8].

Scanning LASER therapy consists of highly precise LASER optics system to deliver LASER energy to a given area of treatment. The LASER optics is deliver by LASER reflecting mirrors mounted on very high frequency motors controlled by microprocessors. This system allows the user to quickly set the area of treatment and thereby easily deliver even dose of LASER energy to a given area without the need of operator. Scanning LASER is the best method of treating all type of wounds, burns and superficial and deep seated pains[8]. LASER has demonstrated in modulating the inflammatory, proliferative and remodelling phases of the healing process[9]. Important additional effects appear to include a direct influence on neural structures that are damaged by compression or inflammation and this significantly improves nerve recovery[10,11].

Several studies have been conducted to examine the recovery of the pain and functional activity in piriformis syndrome subjects. Many piriformis subjects have been aggravation of pain with activities that increase the tension of piriformis like prolonged sitting, walking, squatting, hip adduction and internal rotation. A study to identify neural mobilization a therapeutic efficacy in a piriformis syndrome model: An experimental study was conducted and results of this study showed that statistically significant improvement for pain and range of motion of hip and concluded that there is a significant difference with in the neural mobilization and conventional physical therapy treatment. This study showed a limitation of to compare the different kinds of other physiotherapy treatments for piriformis syndrome[12]. A study to find the efficacy of therapeutic LASER for piriformis syndrome was conducted and results of this study showed that there is statistically significant improvement for pain, ROM and function status in subject with piriformis syndrome. It was conclude that there is a significant improvement in subject who underwent in experimental group. This study showed a limitation of long duration of 4 weeks[13]. Hence the study conducted to compare the efficacy of neural mobilization and LASER on pain and functional activity of lower limb in subjects with piriformis syndrome with in short duration of 2 weeks.

MATERIALS AND METHODOLOGY

A computer generated set of random numbers were prepared before the start of the study and subjects were randomly assigned into control group and experimental group based on the computerized randomization.

SAMPLE SIZE:- The total number of subjects were 30, 15 in each group

STUDY DESIGN:- Experimental study

STUDY SET-UP:- Department of physiotherapy, SVIMS

STUDY DURATION:-2 weeks (5 sessions/week)

MATERIALS:-

LASER-technomed, High couch and pillow

INCLUSION CRITERIA:-

- Pain in the buttock's that radiates down the leg
- Age between 25-50 years
- Both genders(male and female)
- Acute and subacute paitents
- Special test for piriformis syndrome[14]

1. **LASEQUE SIGN/ STRAIGHT LEG RAISING TEST:-**

   Laseque sign is primarily considered a test of the neurological tissue around the lumber spine, this test also places a stress on the sacroiliac joint. The patient in the supine position, the examiner passively flex the patients hip with the knee extended. Pain occurring after 70* is usually indicative of pain.

2. **FREIBERG SIGN: -** Involves pain and weakness on passive forced internal rotation of the hip in the supine position. The pain is thought to be a result of passive stretching of the piriformis muscle and pressure placed on the sciatic nerve at the sacrospinous ligament. Positive in 56,2% of the patients.

Minimum two signs should be positive to conform the diagnosis of piriformis syndrome.

EXCLUSION CRITERIA:-

- Any pathology around the hip
- Pain due to spinal or pelvic origin
- Any other referred pain from hip and SI joint
- Any recent injuries around the hip and knee
- Limb length discrepancy

METHODOLOGY:-

Subjects who fulfilled the inclusion and exclusion criteria were divided into two groups, experimental group and control group. Informed consent was taken from each of the subjects prior to participation. Instructions were given to the subjects about techniques performed.

A total of 30 subjects were divided equally into two groups by random lottery method. Experimental group (n=15) and control group (n=15).

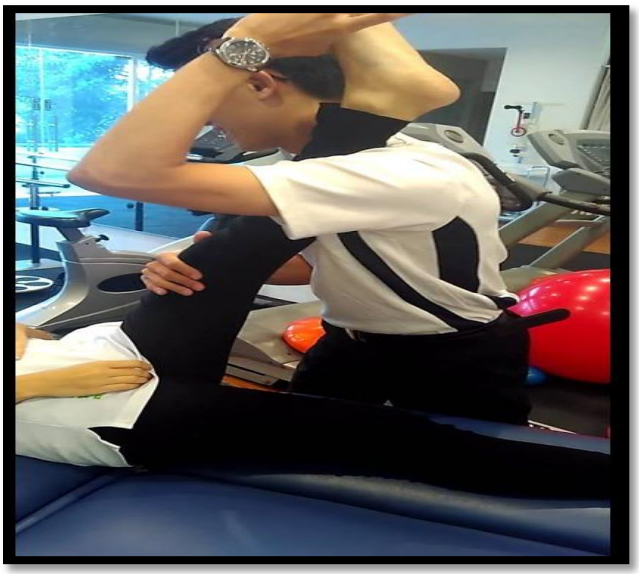
Experimental group – Neural mobilization + laser

Control group – laser

EXPERIMENTAL GROUP RECEIVED NEURAL MOBILIZATION AND LASER

NEURAL MOBILIZATION:-

Experimental group received neural mobilization for approximately 12-15 minutes per session including 30 sec hold and 1 min rest. The straight leg raise was done for inducing longitudinal tension (traction) as the sciatic nerve runs posterior to hip and knee joints while maintaining extension at the knee. In order induce dural motion through the sciatic nerve; the leg was raised past 35 degrees in order to take up slack in the nerve. Since the sciatic nerve is completely stretched at 70 degrees, pain beyond that point is usually of hip, sacroiliac, or lumbar spine origin[15]. The unilateral straight leg raise causes traction on the sciatic nerve, lumbo sacral nerve roots, and dura mater. Adverse neural tension produces symptoms from the Piriformis muscle (buttocks area) extending into the sciatic nerve distribution of the affected lower limb. To introduce additional traction into the proximal aspect of the sciatic nerve, hip adduction was added to the straight leg raise.



CONTROL GROUP RECEIVED LASER

LASER[8]:-

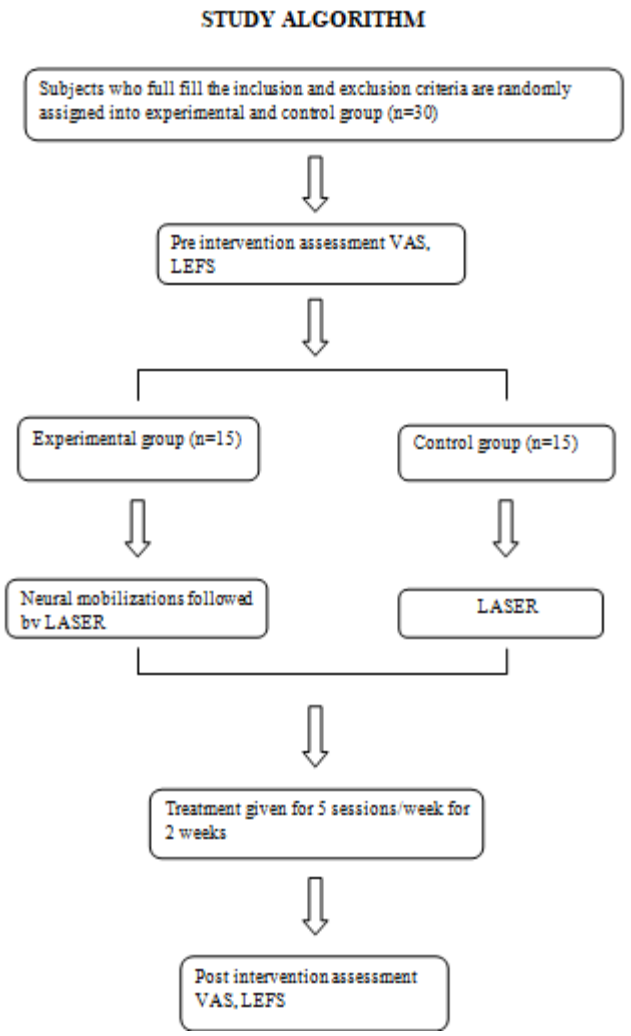
Control group received low level laser therapy (LLLT). LLLT was applied to the skin projection at the anatomical site of the piriformis muscle.

The parameters were different in acute and sub acute.

PARAMETERS:-	ACUTE CONDITION	SUB ACUTE CONDITION
WAVE LENGTH	808NM	808NM
DOSAGE	20.0 J/SQ.CM	16.0 J/SQ.CM
LENGTH	4 CM	4CM
WIDTH	3 CM	3CM
MODE	CONTINUOUS	CONTINUOUS
AREA	12 SQ.CM	12 SQ.CM
TREATMENT TIME	16M:40S	13M:30S

SAFTY PRECAUTIONS ADVICED FROM FIRST DAY ON WORDS:-

- Avoid sitting for prolong period of time, especially on hard surfaces, avoid forward bending and avoid prolong standing.



STATISTICAL ANALYSIS

Statistical analysis was done using graph pad instant 3version software excel. For this purpose the data was entered into Microsoft excel spread sheet.

Out of the 30 subjects, 15 were randomized into experimental group and 15 into control group. All subjects completed the entire study protocol by 2 weeks. The outcome measures of this study for which statistical analysis was done are VAS and LEFS.

DEMOGRAPHIC CHARACTERISTICS:-

Demographic characteristics of experimental and control group shown in below table. the mean age of experimental group (n=15) was 43.27 ±4.21 and mean age group of control group was 41.67±4.56.

TABLE-1: COMPARISON OF THE DEMOGRAPHIC PARAMETERS BETWEEN EXPERIMENTAL GROUP AND CONTROL GROUP SUBJECTS:

VARIABLE	EXPERIMENTAL GROUP (N=15)	CONTROL GROUP (N=15)
AGE (YEARS)	43.27 ±4.21	41.67±4.56
GENDER-MALE: FEMALE	7:8	7:8
LEFT/RIGHT	8:7	7:8

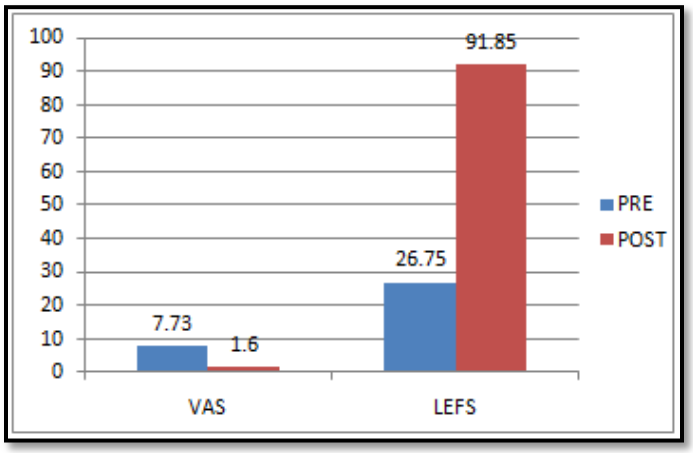
TABLE-2:-ANALYSIS OF PRE AND POST MEAN VALUES OF VAS AND LEFS OF EXPERIMENTAL GROUP

EXPERIMENTAL GROUP							
	PRE-TEST VALUES		POST-TEST VALUES				
	MEAN	MEAN±SD	MEAN	MEAN±SD	DF	T-VALUE	P-VALUE
VAS	7.733333	0.883715102	1.6	1.183215957	92	22.40763	0.00000000
LEFS	26.75	3.400367627	91.85	5.605959839	-976.5	-31.6964	0.00000000

SD=standard deviation, DF=degrees of freedom

To compare pre and post values for the parameters VAS and LEFS in experimental group, the paired t-test has been used. From above table we observed that the post values have shown some significant improvement for VAS and LEFS on the subjects.

GRAPH-1: THE FOLLOWING DIAGRAMMATIC REPRESENTATION REPRESENTS THE MEAN SCORE FOR THE PARAMETERS VAS AND LEFS IN PRE AND POST VALUES IN EXPERIMENTAL GROUP.



EXPERIMENTAL GROUP

TABLE-3:- ANALYSIS OF PRE AND POST MEAN VALUES OF VAS AND LEFS OF CONTROL GROUP

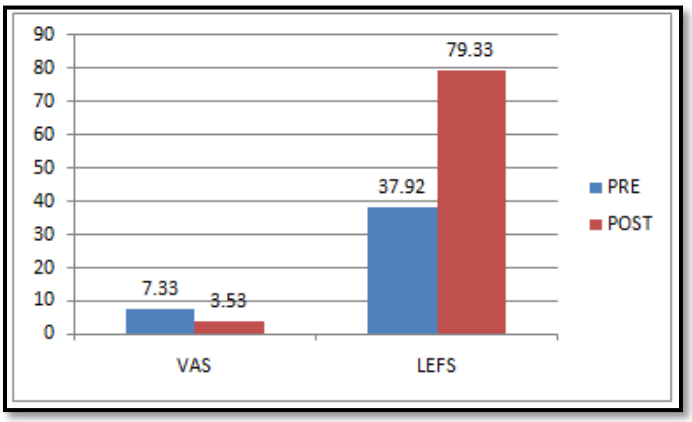
CONTROL GROUP							
	PRE-TEST VALUE		POST-TEST VALUE				
	MEAN	MEAN±SD	MEAN	MEAN±SD	DF	T-VALUE	P-VALUE
VAS	7.333333	0.723746864	3.533333	0.833809388	57	26.25227	0.31402911
LEFS	37.91667	5.232681185	79.33333	5.172615623	-621.25	-20.1159	0.00000000

SD=standard deviation; DF=degrees of freedom

To compare pre and post values for the parameters VAS and LEFS in control group, the paired t-test has been used. From above table we observed that the post values have shown some significant improvement for VAS and LEFS on

the subjects.

GRAPH-2: THE FOLLOWING DIAGRAMMATIC REPRESENTATION REPRESENTS THE MEAN SCORE FOR THE PARAMETERS VAS AND LEFS IN PRE AND POST VALUES IN CONTROL GROUP.



CONTROL GROUP

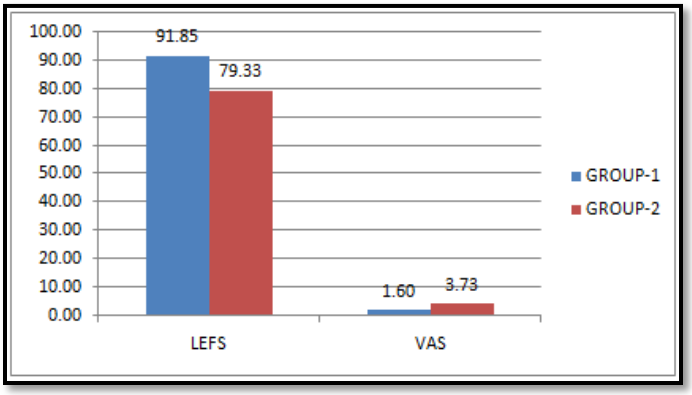
TABLE-4: ANALYSIS OF COMPARISON OF MEAN DIFFERENCE OF VAS AND LEFS BETWEEN EXPERIMENTAL GROUP AND CONTROL GROUP

	EXPERIMENL GROUP		CONTROL GROUP				
	MEAN	MEAN±SD	MEAN	MEAN±SD	DF	T-VALUE	P-VALUE
LEFS	91.85	91.85±5.6	79.33	79.33±5.172	187.75	5.54	0.00
VAS	1.60	1.6±1.18	3.73	3.73±1.09	32.00	5.49	0.04

SD=standard deviation; DF=degrees of freedom

The test is significant between experimental group and control group, the unpaired t-test has been used. From above table we observed that there is statistically significant for VAS and LEFS in experimental group when compared to control group.

GRAPH-3 THE FOLLOWING DIAGRAMMATIC REPRESENTATION REPRESENTS THE SIGNIFICANCE IN THE RESPECTIVE PARAMETERS:



Comparison of mean differences of VAS and LEFS b/w experimental and control groups

RESULTS

The results were found to be statistically significant in both experimental groups and control groups for VAS and LEFS, but there is a more significance for VAS and LEFS in experimental group when compare to control group. Hence, the study showed that there is statistically significant improvement for pain intensity and functional activity when a neural mobilization and LASER it has shown better results in experimental group.

DISCUSSION

The purpose of this study was to investigate the efficacy of neural mobilization and laser on pain and functional activity of lower limbs in subjects with piriformis syndrome. Based on the statistical analysis the alternate hypothesis stating that neural mobilization along with LASER therapy reduces pain and increase functional activity in subjects with piriformis syndrome can be accepted and null hypothesis is rejected. Experimental group and control group both showed statistically significant difference between pre and post treatments in values of VAS and LEFS. But the subjects in experimental group showed better improvement than control group in terms of sources in VAS and LEFS. The statistical significant results in experimental group explained due to the effect of neural mobilizations and LASER. The subjects who participated in these study adult ranged from 25-50 years of age due to high prevalence of piriformis syndrome in this age group. This study showed decreases pain intensity and improvement in functional activity in majority of subjects in the experimental group. Result showed improvement in both intervention group on pain intensity and functional status but the improvement was statistically insignificant between experimental group and control group in terms of pain intensity and LEFS. Butler in the year 1991 recommends that neural mobilization may be viewed as another form of manual therapy similar to joint mobilization. This helps to mitigate pain and improves the mechanical adaptability of nervous system allowing the body to move with less resistance. In addition, nerve mobilization reduces scar tissue within the nervous system directly reducing pain. In order to pay heed to it, manual method should be used by restoring the mechanical function of impaired neural tissue (intra and extra neural impairment) in the lumbo-pelvic lower limb complex. According to Gladson R. F. Bertolini et al (2009) the neural mobilization technique was used to regain the movement and elasticity of the nervous system, with the objective of improving neuro dynamics and re-establishing axoplasmic flow, thus restoring nerve tissue homeostasis, which promotes the return to its normal functions[16].

The biological actions of LASER are multiple. Studies have documented changes in biochemical markers of inflammation, the distribution of inflammatory cells and a reduction in the occurrence of oedema, haemorrhage and necrosis after local laser irradiation with different sources of LASER beams. Additional effects may include a direct influence on neural structures that are damaged by

compression[17,18]. LASER phototherapy improves peripheral nerve recovery[19]. LASER may have direct effect on neural structures, which could increase the nerve recovery (or) inhibit A and C fibres transmission[20].

CONCLUSION

The basic hypothesis of this study was that neural mobilization in conjunction with laser would enhance the functional activity of the lower limb in subjects with piriformis syndrome. These findings are consistent with the previous studies. The enhanced functional activity by neural mobilization and laser can account for the improvement in the physical status of the subject. Certainly the neural mobilization and laser combination would positively affect the functional status of the subjects.

Hence, alternative hypothesis is accepted and null hypothesis is rejected

LIMITATIONS

1. The sample size is relatively small.
2. No follow up period.

RECOMMENDATIONS

1. Studies may further be conducted on specific nerves.
2. The study can be done with other techniques.
3. The study can be done with large sample size.

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