A Comparative Study To Determine The Effectiveness Of Low Level Laser Therapy And Strong Surge Faradic Current On Trapezius Spasm

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Abstract: Background: This study was designed to determine and compare the effect of low level laser therapy and strong surge faradic current on trapezius spasm. Material And Methods: Group A consisted of 15 subjects who received Low Level Laser Therapy and Group B consisted of 15 subjects who received Strong Surge Faradic current. On the 1st and 5th day Numerical pain rating scale (NPRS) was taken to measure pain intensity, Hubbard's "Tenderness grading scale" was used for assessment of soft tissue tenderness and Cervical side flexion and rotation range of motion was measured using universal goniometer. Result: The t-value for NPRS, tenderness, cervical side flexion and rotation were 12.52, 11.05, -7.28 and -8.76 respectively. So, there was significant difference in all the outcome measures between Group A and Group B at level of significance p=0.00. Conclusion: The results of this study demonstrated that LLLT and SSF current both the interventions are effective for treatment of trapezius spasm. But SSF current is more effective than LLLT in improving cervical rotation range of motion. [Mehta K sain A Natl J Integr Res Med, 2020; 11(3):33-38]

Key Words: Low level laser therapy, Strong surge faradic current, Trapezius spasm.

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Introduction: Trapezius pain is the classic stress pain and it is the most common musculoskeletal disorder. The prevalence of trapezitis has risen dramatically in recent years and is foremost among the causes of musculoskeletal pain. The prevalence varies from 21% of patients seen in a general orthopaedic clinic to 30% of general medical clinic patients with regional pain to as high as 85% to 90% of patients presenting to specialty pain management center. Women and men are affected equally. The upper trapezius muscle is designated as postural muscle and it is highly prone to overuse. Trapezius muscles help with the function of neck rotation, lateral flexion and extension. Because the trapezius muscle works to move the neck in several directions, its degree of tightness or looseness affects neck range of motion. Any position which places trapezius in a shortened state for a period of time without rest may shorten the fibers and lead to dysfunction and limited movements of neck. For people who work at desks and computers, or who spend many hours driving, in them the upper trapezius becomes very sore and painful[1].

In clinical settings, low-level laser therapy (LLLT) has been carefully used in the treatment of musculoskeletal disorders, with its anti-inflammatory, analgesic, myorelaxant, tissue-healing, and biostimulation effects. Previous clinical studies have found positive effects of LLLT in musculoskeletal disorders such as neck muscle pain[2], fibromyalgia[3], and a resultant reduction in the use of drugs[4, 5]. Electrical muscle stimulation (EMS) in the form of surged faradic current is the application of electrical current to elicit a muscle contraction. Use of EMS for orthopaedic and neuromuscular rehabilitation has been given significantly in recent years. Electrical muscle stimulation gives relaxation to spasm. Increased production of endorphins is believed to be a consequence of electrical stimulation. This natural, body generated analgesic is produced normally when the body detects a painful stimulus[6].

Kannan et al. studied the effect of therapeutic ultrasound, LASER and ischemic compression in reducing pain and improving cervical ROM among patients with myofascial pain of upper trapezius. They concluded that LASER therapy showed better improvement in pain than the other two groups[7].

Kim et al. studied the immediate effect of 975nm LLLT on myofascial trigger point of upper trapezius muscle in subjects with rounded shoulder posture. The results showed that an immediate reduction was observed in pressure-pain threshold and VAS following application of laser therapy[8].

Anand B. Heggannavar et al. did a study to compare the Effect of 50% Ramp-Up And 100% Ramp-Up Faradic Stimulation in Patients with Non-Specific Trapezius Spasm - A Randomised Clinical Trial. They concluded that 50% ramp up faradic stimulation is better than 100% ramp up faradic stimulation in patients with non- specific trapezius spasm[9].

Kshama. S. Shettyet al. studied the Effect of Surged Faradic Current on Myofascial Trigger Point of Upper Trapezius Muscle as Compared with Manual Pressure Release.Surged faradic current and manual pressure release have got beneficial effect in reducing the pain intensity and increasing the range of motion in patients with Mtrps in upper trapezius[6].

There are many therapeutic interventions in physiotherapy for the treatment of trapezius spasm. Low Level LASER Therapy (LLLT) has been applied in several rheumatoid and soft-tissue disorders with varying rates of success.

Surging of faradic current produces effect on musculoskeletal properties by increasing the blood flow to the muscles and it also enhances the contractile property of the muscle. There are many clinical therapists who have seen the effect of SSF on patients with trapezius spasm but there are no studies done to see effect of SSF on patients with trapezitis.

In addition to it, there are very few studies available in literature comparing the effectiveness of LLLT [7, 8] and Strong Surge Faradic (SSF) Current on Trapezius spasm. Hence this study is to determine and compare the effectiveness of LLLT and SSF on pain, tenderness and cervical range of motion in patients with trapezius spasm.

Material & Methods: Study Design: Comparative interventional study. The present study consisted of 2 groups i.e. group A subjects who received low level laser therapy and group B subjects who received strong surge faradic current.

30 subjects were randomly selected for the study from the outpatient department of Government Physiotherapy College, Jamnagar, with 15 subjects in each group. Age group of subjects was 18-23 years. Before giving the intervention subjects were screened for eligibility criteria and informed consent was obtained from them.

Inclusion Criteria: Both male and female subjects of 18 to 23 years, who were willing to participate in the study, were taken. The subjects with traumatic neck pain, cervical radiculopathy, any infectious condition or sensory complications in neck region, subjects contraindicated for LASER therapy or Electrical Stimulation were excluded.

Procedure: Ethical clearance was obtained from institutional ethical committee. The patients will assume a comfortable sitting position on a chair, while the affected area will be properly exposed. The cluster laser probe will be held in direct contact and perpendicular to the affected trapezius muscle.

Protocol For Laser Therapy:

1. Laser Type: - Red+ Infrared LASER (class 3B); (BTL -445-25-RI).
2. Wavelength: - 685+830 nm.
3. Laser Probe: -Cluster probe with area with of 25 cm^2.
4. Power Output: - 1300+200 mw.
5. Mode: - Continuous.
6. Dosage: -18 J/cm^2.
7. Treatment Time: - 5 minutes.

The same procedure will be followed for patients who will receive SSF Current. The electrodes will be held in direct contact on the affected trapezius muscle.

Image 1: Laser Therapy Placement

Protocol For SSF:

1. Frequency: - 100Hz.
2. Pulse Width: - 0.7msec.
3. Surge Duration: - 0.5sec.
4. No of Contractions: - 10.
5. Intensity: - As per patient's tolerance.

Image 2: SSF Current Placement

Subjects were treated with one session per day for 5 days. On 1st and 5th day Numerical pain rating scale (NPRS) was taken to measure pain intensity, Hubbard's "Tenderness grading scale" was used for assessment of soft tissue tenderness and Cervical side flexion and rotation range of motion was measured using universal goniometer.

Materials And Apparatus Used:

1. Consent Form.
2. Laser (Class 3B); (BTL-445-25-RI).
3. Protective Goggles.
4. Electrical Stimulator(Techno med Electronics).
5. Stool.
6. Universal Goniometer.
7. Pen.

Image 3: Laser Machine

Image 4: Protective Goggles

Image 5: Electrical Stimulator

Statistical Analysis: All analysis was carried out in SPSS windows Version 20.0. An alpha-level of 0.05 was used to determine statistical significance. Paired and independent sample t-test was used to compare pre and post values of NPRS, tenderness, cervical side flexion and cervical rotation range of motion.

Results: The results are shown in the below tables.

Table 1: Demographic Characteristics Of All Subjects

Group	N	Gender		Age(Years)
Group A(LLLT)	15	Male	3	20.73 (1.48)
		Female	12	
Group B (SSF)	15	Male	3	22 (1)
		Female	12	

All data are expressed as Mean (SD), N= number of subjects.

Table 2: Comparison Of Outcome Measures Between Group A And B

Outcome Measures		Mean (SD)	t-value	p-value	Result
NPRS	Pre	6.90 (1.47)	12.52	0.00	Significant
	Post	3.70 (1.95)			
Tenderness	Pre	2.23 (0.62)	11.05	0.00	Significant
	Post	0.90 (0.75)			
Cervical Side flexion (º)	Pre	32.33 (7.20)	-7.28	0.00	Significant
	Post	40.20 (8.03)			
Cervical Rotation(º)	Pre	43.50 (6.21)	-8.76	0.00	Significant
	Post	48.16 (6.70)			

As shown in table 2, there is significant difference in all the outcome measures between Group A and Group B at level of significance p=0.00.

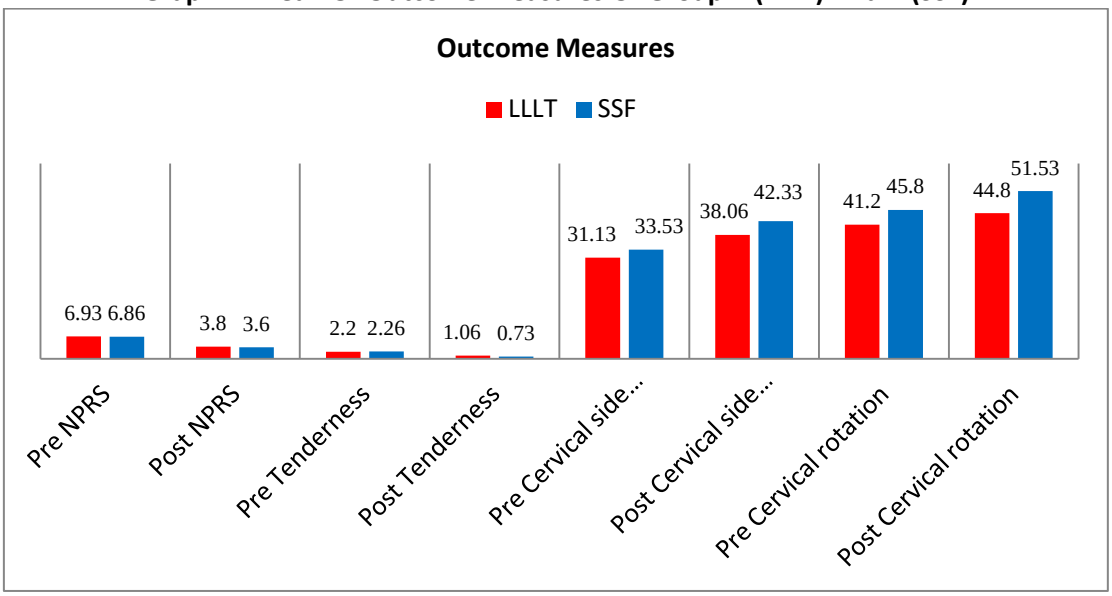
In table 3, there is no significant difference in NPRS, tenderness and cervical side flexion range of motion between Group A and Group B at level of significance p>0.05.

And there is significant difference in cervical rotation range of motion between Group A and Group B at level of significance p<0.05.

Table 3: Inter Group Comparison Of Outcome Measures

Outcome Measures	Group	Mean Difference	T-Value	P-Value	Result
Nprs	A	3.13	0.25	0.79	Not Significant
	B	3.26			
Tenderness	A	1.13	1.05	0.29	Not Significant
	B	1.40			
Cervical Side Flexion (º)	A	6.93	0.86	0.39	Not Significant
	B	8.80			
Cervical Rotation (º)	A	3.60	2.12	0.04	Significant
	B	5.73			

Graph 1: Mean Of Outcome Measures Of Group A (LLLT) And B (SSF)



Discussion: The main issue in the myofascial spasm and trigger point treatment is to provide pain relief on trigger points. The major treatment methods are patient training, elimination of trigger factors, medical treatment, superficial & deep heat applications, electrotherapy, stretching and spray technique, acupuncture, local injections, massage and exercise[7].The present study was designed as a two group comparative analysis to objectively record the effect of therapeutic low level laser therapy and strong surge faradic current in reducing pain and tenderness, improving cervical range of motion among cases with trapezius spasm.

In the present study total 30 subjects with trapezius spasm were taken and they were divided into 2 groups, A (Low Level Laser Therapy) group and B (Strong Surge Faradic current) group. NPRS, Tenderness, Cervical side flexion and rotation range of motion was assessed on 1st day before giving the intervention and 5th day after giving the intervention. The results of the present study shows mean of difference NPRS, Tenderness, Cervical side flexion and rotation range of motion for Group A were 3.13, 1.13, 6.93, 3.60 and for Group B were 3.26, 1.40, 8.80, and 5.73 respectively. Thus, based on statistical analysis, both group A (LLLT) and B (SSF) both group showed improvement in NPRS, tenderness and cervical range of motion. But SSF is more effective for treatment of trapezius spasm than LLLT in improving cervical rotation range of motion. This is because SSF helps in reduction of muscle tension which occurred due to trapezius spasm.

Kannan et al. studied the effect of therapeutic ultrasound, LASER and ischemic compression in reducing pain and improving cervical ROM among patients with myofascial pain of upper trapezius and it was concluded that LASER therapy showed better improvement in pain than the other two groups because of Laser's ability to stimulate protein synthesis, soft tissue repair and subsequent tissue regeneration[7]. These findings are consistent with the result of our present study. Researchers have suggested mechanisms for pain relief using laser, which includes the secretion of endogenous opioids, such as in

acupuncture and transcutaneous electrical nerve stimulation, leading to clearance of the analgesic substances via stimulation of the microcirculatory system[10, 11].

Jung-hoon Lee et al. did a clinical trial to determine the immediate effects of 830-nm low-level laser therapy on the myofascial trigger point of the upper trapezius muscle in visual display terminal workers and it was concluded that the application of approximately 128.6 J/cm^2 and 6429 mW/cm^2 to the MTrP of the upper trapezius muscle, using a GaAlAs laser at 830 nm and 450 mW, did not produce immediate changes in PPT and tenderness at 3 kg does not necessarily mean that the LLLT is not effective at reducing pain which is in contrast to our study.

Our findings are in contrast to the results of Lee et al., who studied the dose dependent effect of 830nm, 450mW LLLT on the myofascial trigger point of upper trapezius muscle. A 0.07cm ^{2} single probe laser with varying energy density was used for each group. It was found that a high energy of 1929 J/cm^2 was necessary to produce an immediate effect on pain. This may be due to the small area covered by single probe laser and relatively small power output as compared to our study[12].

The pain in the subjects with trapezius spasm was mainly due to attaining abnormal and static positions, lowering the threshold of motor unit activation, decreased blood flow to the muscle and retention of calcium ions[13]. According to Froster and Palastanga faradic stimulation brings about similar effects of normal voluntary contractions, which causes increased in metabolism and increased removal of waste products that could lead to reduction in pain[14].

Surging of faradic stimulation produces various beneficial effects. It helps to restore the normal muscle tone. It leads to elevated blood flow to the muscles as well as rapid removal of waste metabolites from the body therefore enhancing the chemical and physiological properties of the muscle. There is increased supply of nutrients as well as oxygen to the muscle being treated. Results of our study are similar to the study of Anand B. Heggannavar et al. who compared the effect of 50% Ramp-Up And 100% Ramp-Up Faradic stimulation in patients with Non-specific trapezius spasm[9]. Kshama. S. Shettyet al. did a study to determine and compare the effect of Surged Faradic Current on Myofascial Trigger Point of Upper Trapezius Muscle with Manual Pressure Release. It was found that there is reduction in NPRS and improvement in active cervical movement (lateral flexion and side rotation) after 7 sessions of treatment for both Group A (Subjects received surged faradic current, manual pressure release, and sham ultrasound) and Group B (Subjects received manual pressure release, sham ultrasound).

It indicates that surged faradic current and manual pressure release have got beneficial effect in reducing the pain intensity and increasing the range of motion in patients with Mtrps in upper trapezius[6]. This supports the results of our study that SSF helps in pain reduction and increase cervical range of motion.

Limitations of the study were that male: female ratio was not equally distributed.The data was collected only from the young adult population. So, the results cannot be generalized for other populations. Future studies can be performed on elderly populations and in a larger population.

Conclusion: Low level laser therapy (LLLT) and Strong surge faradic current (SSF) both the interventions are effective in alleviation of symptoms of trapezius spasm. But SSF is more effective for treatment of trapezius spasm than LLLT in improving cervical rotation range of motion.

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