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Journal of Clinical and Laboratory Research
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Research Article

Effects of Neuro-Muscular Electrical Stimulation and Graded Oscillatory Mobilization for an Individual with Post Stroke Reflex Sympathetic Dystrophy

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Received Date: February 01, 2024 | **Accepted Date:** February 15, 2024 | **Published Date:** February 20, 2024

Citation: Muhammed Kamruzzaman, Delwar Hossain, (2024), Effects of Neuro-Muscular Electrical Stimulation and Graded Oscillatory Mobilization for an Individual with Post Stroke Reflex Sympathetic Dystrophy, *Journal of Clinical and Laboratory Research*, 7(3); **DOI:**10.31579/2768-0487/126

Abstract

Background: Reflex sympathetic dystrophy syndrome (RSD) is a disorder that causes lasting pain, usually in an arm or leg, and it shows up after an injury, stroke, or even heart attack. But the severity of pain is typically worse than the original injury itself.

Objective: To assess effects of Neuro-Muscular Electrical Stimulation and Graded Oscillatory Mobilization for an individual with Post Stroke Reflex Sympathetic Dystrophy.

Methods: This was cross sectional descriptive study. Visual Analog Pain Scale (VAS) and Voluntary Control Grade (VCG) were used. Thirty individuals with Post stroke Reflex Sympathetic Dystrophy (RSD) were included in the study purposively.

Results: In study group there is a very good improvement of pain and good improvement of pain and very good improvement of voluntary control grade and patient can easily move shoulder joint. In control group there is an excellent improvement of pain and very good improvement of voluntary control grade and patient can easily move shoulder joint.

Conclusion: Effects of Neuro-Muscular Electrical Stimulation and Graded Oscillatory Mobilization for an individual with Post Stroke Reflex Sympathetic Dystrophy is proven.

Key words: neuro-muscular electrical stimulation; graded oscillatory mobilization; reflex sympathetic dystrophy

Introduction

Post stroke Reflex Sympathetic Dystrophy (RSD) is a health problem among populations in developing countries, and a major cause of medical expanse, absenteeism, and disability. Although RSD usually is self-limiting and benign disease that tends to improve spontaneously over time, a many varied therapeutic interventions are available for the treatment of Post stroke Reflex Sympathetic Dystrophy. However, the effectiveness associated with most of these interventions has not yet been demonstrated beyond doubt and, consequently, the therapeutic management of Post stroke Reflex Sympathetic Dystrophy varies widely. One of the major challenges for researchers in the field of Post stroke Reflex Sympathetic Dystrophy is to provide evidence of which treatment, if any, is of most benefit for subgroups of patients Post stroke Reflex Sympathetic Dystrophy. Neuro-Muscular Electrical Stimulation and Graded Oscillatory Mobilization with exercise therapy is a widely treatment for an individual with Post stroke Reflex Sympathetic Dystrophy. Like other developing country in Bangladesh, stroke with hemiplegia is more clinical problem. Because hemiplegia causes a great hamper in flow of life and produce disability which reduce earning capacity of an individual. Overall, it has a negative impact on our population health and economic growth. Stroke with hemiplegia may last for 2 weeks to six months even 12 months or even life long, If patient did not treat with physiotherapy properly other complication occur such as pain with restricted movement around affected side of shoulder joint is most common named with Post stroke Reflex Sympathetic Dystrophy. Post stroke Reflex Sympathetic Dystrophy causes pain and restricted like difficult to elevation or abduction of shoulder. Pain may be sudden and sharp or it may be occurred with movement, changing posture also during sleeping. Pain and paresthetic sensation may refer to arm, forearm or also hand. It is important to treat Post stroke Reflex Sympathetic Dystrophy properly. Otherwise, Muscles of arm and shoulder girdle become week. Recent studies have shown that plastic

changes in the central nervous system may be closely related to poststroke rehabilitation.1-2 As for the methods of rehabilitation treatment, quite a few domestic and foreign literatures have reported that the group training treatment model can achieve satisfactory results, but the effect is relatively slow. Neuromuscular electrical stimulation (NMES) has been applied to the treatment of stroke patients since the last century.3 The peak current of NMES with a specific waveform can maximize the number of responsive motor units and the rate at which they are generated, resulting in tonic contraction and powerful force.4 The application of NMES can not only improve muscle strength but also reduce the spasm of muscles by inducing relaxation or mutual inhibition by maximum contraction.5 Bakhtiary and Fatemy6 found that NMES observably improved the muscle strength of anterior tibial muscle and ankle dorsiflexion muscle and the static spasm of plantar flexor. Barth et al.7 also suggested that the application of electromyographic- (EMG-) triggered NMES to the anterior tibial muscle five days per week for 4 weeks in patients with chronic stroke could improve the range of motion of ankle dorsiflexion, balance, and gait. You et al.8 emphasized the potential efficacy of NMES in the treatment of foot drop and showed that NMES has a beneficial help in the recovery of spasm after stroke.

Methods

Study design: Descriptive cross-sectional method

Material Used

- Visual Analog Pain Scale (VAS)
- Voluntary Control Grade (VCG)

Sample Design

Purposive sampling method

Sample Size

Thirty individuals with Post stroke Reflex Sympathetic Dystrophy (RSD)

Study Setting

Department of Physiotherapy, Gono Bishwabidyalay, Savar, Dhaka.

Rehabilitation Center for Disabled (RCD) at Holy Crescent Hospital Ltd, Khulshi, Chittagong.

Khagrachary Pain Paralysis Physiotherapy &Rehabilitation Center (KPRC) Khagrachary

Inclusion Criteria

- ❖ Reflex Sympathetic Dystrophy (RSD) causes Shoulder Pain of Any Stroke with Hemiplegic Patient
- ❖ Frozen shoulder of Stroke with Hemiplegic Patient
- ❖ Shoulder pain of Untreated Patient of stroke with Hemiplegia

Exclusion Criteria

- ❖ Shoulder Pain due to Trauma
- ❖ Frozen shoulder due to Trauma
- ❖ Frozen shoulder due to Osteoarthritis
- ❖ Subluxation of Shoulder joint without stroke patient
- ❖ Dislocation of Shoulder Joint

Results

Control group

Patient ID	Age	Sex	VAS	VCG
617	67	M	9	2
344	56	F	6	4
520	45	F	5	4
620	48	M	7	3
321	42	F	4	5
342	60	F	5	3
436	72	M	6	3
742	50	F	8	3
673	58	M	7	2
804	60	M	3	5
756	53	F	6	3
724	41	F	5	3
764	59	F	7	2
564	63	M	6	3
234	71	F	9	1

Table1: Pretreatment data of control group of individuals.

Patient ID	Age	Sex	VAS	VCG
617	67	M	5	4
344	56	F	3	2
520	45	F	2	5
620	48	M	3	5
321	42	F	0	6
342	60	F	1	5
436	72	M	3	4
742	50	F	3	5
673	58	M	2	5
804	60	M	1	5
756	53	F	2	5
724	41	F	0	6
764	59	F	2	4
564	63	M	1	5
234	71	F	3	4

Table 2: Post treatment data of control group of individuals.

Measures	Age	VAS	VCG
Total Number	15	15	15
Mean	56.33	6.2	3.07
Standard Deviation	9.47	1.64	1.06
Confidence Interval (+-)	112.66 or 0.00331	12.4 or 0	6.13 or 0

Table 3: Results of Pretreatment.

Measures	Age	VAS	VCG
Total Number	15	15	15
Mean	56.33	2.067	4.67
Standard Deviation	9.47	1.289	0.94
Confidence Interval (+-)	112.66 or 0.00331	4.1328 or 0.0012	9.27 or 0.07

Table 4: Results of post treatment.

Case study group

Patient ID	Age	Sex	VAS	VCG
117	57	M	8	2
334	66	M	6	4
420	46	F	5	4
520	48	M	7	3
329	49	F	4	5
302	61	F	5	3
486	70	M	6	3
642	53	F	8	3
873	57	F	7	2
814	61	M	4	5
846	58	F	6	3
924	44	M	5	3
754	58	F	7	2
644	62	M	6	3
284	72	F	8	1

Table 5: Pretreatment data of case study group of individuals.

Patient ID	Age	Sex	VAS	VCG
117	57	M	5	3
334	66	M	4	4
420	46	F	3	5
520	48	M	4	3
329	49	F	1	6
302	61	F	2	3
486	70	M	3	4
642	53	F	3	4
873	57	F	1	5
814	61	M	2	5
846	58	F	3	4
924	44	M	2	3
754	58	F	3	5
644	62	M	2	5
284	72	F	3	4

Table 6: Post treatment data of case study group of individuals.

Measures	Age	VAS	VCG
Total Number	15	15	15
Mean	57.47	6.13	3.07
Standard Deviation	8.09	1.31	1.06
Confidence Interval (+-)	114.94 or o	12.26 or 0	6.14 or 0

Table 7: Results of Pretreatment.

Measures	Age	VAS	VCG
Total Number	15	15	15
Mean	57.47	6.13	3.07

Standard Deviation	8.09	1.31	1.06
Confidence Interval (+-)	114.94 or o	12.26 or 0	6.14 or 0

Table 8: Results of Post treatment.

A total of 15 patients allocated to control group and 15 patients allocated to case group.

1) In control study group visual analogue pain scale (VAS) before vs after treatment Mean 6.2 and 2.06, Standard deviation 1.64 and 1.289, 95% Confidence Interval (CI) 12.40 and 4.1328. Voluntary control grade (VCG) before vs after treatment Mean 3.07 and 4.67, Standard deviation 1.06 and 0.94, 95% Confidence Interval (CI) 6.13 and 9.27. It means, in control group there is an excellent improvement of Pain and very good improvement of voluntary control grade and patient can easily move shoulder joint.

2) In case study group visual analogue pain scale (VAS) before vs after treatment Mean 6.13 and 2.73, Standard deviation 1.31 and 1.06, 95% Confidence Interval (CI) 12.26 and 5.46, 95% Confidence Interval (CI) 6.14 and 8.26. It means, in study group there is a very good improvement of Pain and good improvement of Pain and very good improvement of voluntary control grade and patient can easily move shoulder joint.

Discussion

Reflex sympathetic dystrophy syndrome (RSDS) - also known as complex regional pain syndrome - is a chronic condition characterized by severe burning pain, pathological changes in bone and skin, excessive sweating, tissue swelling, and extreme sensitivity to touch. The syndrome, which is a variant of a condition known as causalgia, is a nerve disorder that occurs at the site of an injury (most often to the arms or legs). It occurs especially after injuries from high-velocity impacts such as those from bullets or shrapnel. However, it may occur without apparent injury. The symptoms of RSDS usually occur near the site of an injury, either major or minor, and include: burning pain, muscle spasms, local swelling, increased sweating, softening of bones, joint tenderness or stiffness, restricted or painful movement, and changes in the nails and skin. One visible sign of RSDS near the site of injury is warm, shiny red skin that later becomes cool and bluish. The pain that patients report is out of proportion to the severity of the injury and gets worse, rather than better, over time. It is frequently characterized as a burning, aching, searing pain, which may initially be localized to the site of injury or the area covered by an injured nerve but spreads over time, often involving an entire limb. It can sometimes even involve the opposite extremity. Pain is continuous and may be heightened by emotional stress. Moving or touching the limb is often intolerable. Eventually the joints become stiff from disuse, and the skin, muscles, and bone atrophy. The symptoms of RSDS vary in severity and duration. However, there are usually three stages associated with RSDS, and each stage is marked by progressive changes in the skin, nails, muscles, joints, ligaments, and bones. Stage one lasts from 1 to 3 months and is characterized by severe, burning pain at the site of the injury. Muscle spasm, joint stiffness, restricted mobility, rapid hair and nail growth, and vasospasm (a constriction of the blood vessels) that affects color and temperature of the skin can also occur. In stage two, which lasts from 3 to 6 months, the pain intensifies. Swelling spreads, hair growth diminishes, nails become cracked, brittle, grooved, and spotty, osteoporosis becomes severe and diffuse, joints thicken, and muscles atrophy. As the patient reaches stage three, changes in the skin and bones become irreversible, and pain becomes unyielding and may now involve the entire limb. There is marked muscle atrophy, severely limited mobility of the affected area, and flexor tendon contractions (contractions of the muscles and tendons that flex the joints). Occasionally the limb is displaced from its normal position, and marked bone softening is more dispersed. The cause of RSDS is unknown. The syndrome is thought to be the result of damaged nerves of the sympathetic nervous system - the part of the nervous system responsible for controlling the diameter of blood vessels. These damaged nerves send inappropriate signals to the brain, interfering with normal information about sensations, temperature, and blood flow. Since RSDS is most often caused by trauma to the extremities, other conditions that can bring about RSDS include sprains, fractures, surgery, damage to blood vessels or nerves, and cerebral lesions. The disorder is unique in that it simultaneously affects the nerves, skin, muscles, blood vessels, and bones. RSDS can strike at any age, but is more common between the ages of 40 and 60. It affects both men and women, but is most frequently seen in women. Although it can occur at any age, the number of RSDS cases among adolescents and young adults is increasing. Investigators estimate that two to five percent of those with peripheral nerve injury and 12 to 21 percent of those with hemiplegia (paralysis of one side of the body) will suffer from RSDS. RSDS is often misdiagnosed because it remains poorly understood. Diagnosis is complicated by the fact that some patients improve without treatment. A delay in diagnosis and/or treatment for this syndrome can result in severe physical and psychological problems. Early recognition and prompt treatment provide the greatest opportunity for recovery. RSDS is diagnosed primarily through observation of the symptoms. However, some physicians use thermography - a diagnostic technique for measuring blood flow by determining the variations in heat emitted from the body - to detect changes in body temperature that are common in RSDS. A color-coded "thermogram" of a person in pain often shows an altered blood supply to the painful area, appearing as a different shade (abnormally pale or violet) than the surrounding areas of the corresponding part on the other side of the body. An abnormal thermogram in a patient who complains of pain may lead to a diagnosis of RSDS. X-rays may also show changes in the bone. Physicians use a variety of drugs to treat RSDS, including corticosteroids, vasodilators, and alpha- or beta-adrenergic-blocking compounds. Elevation of the extremity and physical therapy are also used to treat RSDS. Injection of a local anesthetic, such as lidocaine, is usually the first step in treatment. Injections are repeated as needed. TENS (transcutaneous electrical stimulation), a procedure in which brief pulses of electricity are applied to nerve endings under the skin, has helped some patients in relieving chronic pain. In some cases, surgical or chemical sympathectomy - interruption of the affected portion of the sympathetic nervous system - is necessary to relieve pain. Surgical sympathectomy involves cutting the nerve or nerves, destroying the pain almost instantly. But surgery may also destroy other sensations as well. Functional neuromuscular electrical stimulation is a closed-loop form of electrical stimulation that attempts to restore function in individuals with damaged or destroyed nerve pathways. The prosthetic device delivers individuals pulses through surface or implanted electrodes connected to the neuromuscular system. The stimulation of the peripheral nerves trigger muscle contractions to produce functionally useful movements. One application of NMES is to restore upper extremity functions in individuals with strokes, and C5-C6 tetraplegia (quadriplegia). Other applications of functional NMES include treatment for foot drop by assisting with ankle dorsiflexion and gait training in spinal cord injuries. H-wave stimulation stimulation is a distinct form of electrical stimulation that produces a direct, localized effect on the conduction of underlying peripheral nerves. It differs in wave form from transcutaneous electrical nerve stimulation (TENS). It has been evaluated primarily as a pain treatment from a variety of etiologies including diabetic neuropathy, muscle sprains, temporomandibular joint dysfunction (TMJ), and reflex sympathetic dystrophy (RSD). It has also has been studied for wound healing and improving post-surgical range of motion. There are multiple devices approved through the FDA pre-market approval process. Threshold electrical stimulation is described as the delivery of low-intensity electrical stimulation to target spastic muscles during sleep at home. The stimulation is not intended to cause muscle contraction. Although the mechanism of action is not understood, it is thought that low-intensity stimulation may increase muscle strength and joint mobility, leading to improved voluntary motor function. The technique has been used most extensively in children with spastic diplegia related to cerebral palsy, but also in those with other

motor disorders, such as spina bifida. Devices used for threshold electrical stimulation are classified as "powered muscle stimulators." As a class, the U.S. Food and Drug Administration (FDA) describes these devices as "an electronically powered device intended for medical purposes that repeatedly contracts muscles by passing electrical currents through electrodes contacting the affected body area."

Conclusion

Effects of Neuro-Muscular Electrical Stimulation and Graded Oscillatory Mobilization for an individual with Post Stroke Reflex Sympathetic Dystrophy is positive and satisfactory.

Conflict of interest

This was a self-funding study. There was no conflict of interest.

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DOI:10.31579/2768-0487/126