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Effect of Russian Current with Exercise Vs Exercise Alone on Chronic Inflammatory Demylinating Polyneuropathy

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Abstract

Background: Chronic inflammatory demyelinating polyradiculoneuropathy (CIDP) is aperipheral nervous system autoimmune condition in which the myelin sheath surrounding nerves is attacked, resulting in improper nerve impulse conduction toperipheral nerves.

Aim of Study: To identify the difference between effect of combined exercises and Russian current stimulation and exercises alone on muscle strength and function in chronic inflammatory demyelinating polyneuropathy.

Material and Methods: Twenty-four patients from both sexes diagnosed with chronic inflammatory demyelinating polyneuropathy with average age from 30-50 years participated in the study. Patients were assessed by a blinded independent assessor before and after the treatment. The patients were randomly allocated into two groups: The control group (GI): Included 8 males and 4 females, with mean age of 42 years, treated by the selected physical therapy program. The study group (GII): Included 7 males and 5 females, with mean age of 42.5 years, treated by the selected physical therapy program in addition to Russian current. All patients were assessed by Barthel Index of Activities of Daily Living and isometric strength of Quadriceps using Lafayette Manual Muscle Test System (dynamometer) before and after the treatment.

Results: There were significant difference between groups in right Quadriceps isometric strength (*p*-value=0.05) post-treatment, in favor of experimental group (Russian current plus exercise) and non-significant differences in other side and in function. In addition to that, there were significant difference within both groups in all of these outcomes, with more clinical improvement in function in experimental group.

Conclusion: Addition of Russian current stimulation to exercises led to statistical significant increase in Quadriceps strength and clinical improvement in function compared to exercise alone.

Key Words: *Chronic inflammatory demyelinating polyneuropathy – CIDP – Russian current.*

Introduction

CIDP is characterized by progressive or recurrent symmetric proximal and distal weakness, sensory dysfunction, and changes in deep tendon jerks of all extremities, for at least eight weeks **[1]**. It is not to be confused with Guillain-Barre syndrome (GBS), which has a sudden start. The immunological basis of CIDP is assumed to be its inflammatory-mediated demyelination **[2]**.

It leads to many chronic functional impairments with unpredictable duration **[3]**. It is an autoimmune disease of the peripheral nervous system in which the myelin sheath surrounding nerves is attacked, leading to improper conduction of nerve impulses to peripheral nerves **[4]**. The disease course is heterogeneous and can be monophasic, relapsing or progressive **[5]**.

Russian current is commonly used to enhance muscles in rehabilitation process. It has been used in patients after knee surgery to offset the effects of arthrogenic muscle inhibition and enhance recovery of strength. Also have been used widely in the management of subjects after central nervous system injury to facilitate improvements in gait, prevent disuse atrophy, target improvements in motor control, manage impairments associated with spasticity, or to facilitate exercises **[6]**.

Lafayette Manual Muscle Test System (dynamometer) can be used to assess the muscle strength, Barthel index of activities of daily living for functional ability assessment **[7]**.

This study aimed to: (1) Determine the therapeutic effect of selected exercises on chronic inflammatory demyelinating polyneuropathy, and (2) Determine the therapeutic effect of Russian current stimulation with exercises on chronic inflammatory demyelinating polyneuropathy.

This study can benefit in the physical therapy field and may guide rehabilitation programs of physical therapy towards better results through decreasing time needed to perform activity of daily

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living, decreasing dependency and making patient an active member in society. The role was to investigate the effect of addition of Russian current to therapeutic exercises role in CIDP patients [8].

It was hypothesized that there would be no differences between using exercises alone and exercises with electrotherapy (Russian current) in isometric strength and function in CIDP patients.

Subjects and Methods

Start the study from December 2018 to June 2021 at Kasr El-Ainy Hospital.

I- Subjects:

Study design:

A single blinded randomized control trial, Patients were randomly allocated into two equal groups by computer-based random generator using permuted blocks, after signing the informed consent.

Ethical statement:

The study was approved by the Local Ethical Committee of Faculty of Physical Therapy, Cairo University (No:P.T.REC/012/002174).

Subject selection:

Subject selection: 24 patients were selected from Outpatient Clinic of Kasr El-Ainy Hospital. They were assessed and confirmed by Nerve Conduction study (NCS) and Electromyography Study (EMG).

The selected patients were randomly assigned to two equal groups control group (GI), and study group (GII).

The control group (GI): Patients were treated by the selected exercises physical therapy program.

The study group (GII): Patients were treated by the selected exercises physical therapy program with Russian current. The treatment had been conducted for six weeks, day after day.

All groups were assessed by Barthel Index of Activities of Daily Living and Lafayette Manual Muscle Test System (dynamometer) before and after the treatment.

Inclusion criteria:

Twenty four patients diagnosed as chronic inflammatory demyelinating polyneuropathy selected from the Out-patient Clinic, Kasr El-Ainy Hospital. They were assessed and confirmed by Nerve Conduction study (NCS) and Electromyography Study (EMG).

1- Patient age ranged from 30-50 years.
2- Sensory symptoms included numbness, tingling, gait imbalance.
3- Progression over at least 2 months.
4- Proximal muscles involved along with distal muscles.
5- Deep tendon reflexes reduction or absence.
6- Nerve conduction evidence of a primary demyelinating neuropathy.

Exclusion criteria:

1- Cardiovascular problems (unstable angina, recent myocardial infarction within the last three months, congestive heart failure, significant heart valve dysfunction, or unstable hypertension) or pulmonary disorders.
2- Other causes of neuropathy at time of study (blood glucose, cobalamin, liver enzymes, Wasserman reaction, M-component, erythrocyte sedimentation rate, sodium, potassium, and calcium).
3- Concomitant conditions (e.g., malignancy, chronic infections, hypothyroidism, Anemia, renal and liver disease, Visual, auditory problems, Cognitive impairment.
4- Musculoskeletal disorders such as severe arthritis, knee surgery, total hip joint replacement, lower limb fractures less than six months or contractures of fixed deformity, leg length discrepancy.

II- Instrumentations:

The following tools were used for assessment:

a- Lafayette Manual Muscle Test System (dynamometer): It is an objective device that measure muscle strength and force [9].
b- Barthel Index of Activities of Daily Living: A valid and reliable scale used to assess what a patient can do.

Lafayette Dynamometer [10].

III- Procedures:

a- *Assessment procedures:*

1- Barthel Index of Activities of Daily Living:

The Index should be used as a record of what a patient does, NOT as a record of what a patient could do. If used to assess improvement following rehabilitation, improvements in the total score of more than two points indicate a likely genuine change, and a move from entirely reliant to independent on one item is also likely to be reliable. Select the scoring point that most closely fits the patient's current level of ability for each of the 41 following ten categories. Make a note of the actual, functioning, and not prospective. The patient's self-report, a third party with knowledge of the patient's abilities (such as a relative), or observation can all be used to gather information **[10]**.

2- Lafayette Manual Muscle Test System (dynamometer):

The Lafayette Manual Muscular Tester (MMT) System is an ergonomic hand-held instrument that measures muscle strength objectively. When a clinician applies force to a patient's limb, the test is completed. The doctor's purpose is to "break" or "overcome" the patient's resistance during the test. The MMT records the peak force and the time it takes to complete the "break," resulting in trustworthy, accurate, and stable muscle strength assessments. It was applied on dorsiflexion muscles (tibialis anterior) and quadriceps muscles (knee extensors) for both lower limbs. It was repeated three trails and the mean was taken.

b- *Treatment procedures:*

The duration of treatment was ranged from (50-60min) according to the ability of each patient three times per week for six weeks. Each exercise was performed three sets, each set consists of ten repetitions and patients were allowed to take one minute rest between each set.

Control Group:

Every patient received three sessions per week for six weeks:

- The stretching exercises: For the shortened muscles, Figs. (1,2).
- Facilitation for weak muscles: Through facilitator techniques (extroceptors, muscle tapping, vibration, muscle activation (Isometric, eccentric and concentric contraction).
- Proprioceptive neuromuscular facilitation technique: “Flexion, adduction, external rotation with knee flexion” pattern for lower extremity.

Fig. (1): Stretching calf muscles: patient was in supine position, therapist cupped patient's heel and dorsiflexed the foot, with other hand supported above knee to prevent flexion.

Fig. (2): Stretching hip extensors: Patient was in supine position, foot relaxed, contralateral leg was extended, ipsilateral leg was extended and raised upward, to a level of stretch and maintained 30 seconds for 3 repetitions.

Pelvic stabilization exercises include:

- Pelvic control exercises involving activation of the muscles around the hip joint (hip extensors and hip abductors) and the core muscles (multifidus and transversus abdomensmuscles. Fig. (3).
- Bridging exercises: From supine lying position, with knees bent slowly raise the buttocks from the floor, until the body is straight from the knees to the shoulders. The patient will asked to maintain the bridge position for five secs. Then slowly lower to the starting position.

Fig. (3): Activation of hip abductors: Patient was in crock lying position, with knee flexed 90º, therapist hands at outer part of knees, patient was asked to push against therapist's hands.

Study Group:

- Every patient received three sessions per week for six weeks:
- The session consisted of:

All of the exercises given to control group, plus.

Russian current stimulation for 15min, parameters 50 bursts per second with 50 pulses per burst. The application is 10 seconds on 10 seconds off for a duration of 15min. The application was on Quadriceps muscles.

Fig. (4): Russian current.

Results

The main purpose of this study was to identify the difference between effect of exercise and Russian current stimulation and resistance exercises only on muscle power in chronic inflammatory demyelinating polyneuropathy. Statistical analysis was conducted using SPSS for windows, version 24 (SPSS, Inc., Chicago, IL). The alpha level was set at 0.05. Non-parametric tests (Related-samples Wilcoxon signed rank test for within group differences and independent-samples Mann-Whitney U test for between group differences) for continuous variables were used due to small sample. Chi-square test for sex distribution between groups was used.

Demographic data:

Group A (Control group):

Twelve (8 males, 4 females) patients were included in this group. Their median (IQR) of age was 42 (10.25) years. See Tables (1,2).

Group B (Experimental group):

Twelve patients (7 males, 5 female) were included in this group. Their median (IQR) of age was 42.5 (12.25) years. See Tables (1,2).

Comparing demographic data between both groups, with independent *t*-test (age) and chi-square test (sex distribution), revealed non-significant differences (homogenous groups) (*p*-value >0.66), see Table (2).

Table (1): Descriptive statistics of demographic data for both groups.

Demographic data	Group	Mean	IQR
Age (years)	A	42	10.25
	B	41.5	12.25
Sex distribution (M/F) (count)	A		8/4
	B		7/5

M: Male. F: female.

Table (2): Differences between groups in demographic data.

Demographic data	*p*-value
Age	0.8
Sex distribution^	67

A- Barthel index of activities of daily living:

1- *Within groups differences:*

a- Group A (Control):

The median (IQR) values of Barthel Indexscore at pretreatment and posttreatment were 7 (6) and 14.5 (4.5) points, respectively, see Table (3). There was significant differences between pre and post-treatment (p-value=0.002), with significant improvement in ADLsposttreatment, See Table (4).

b- Group B (Experimental):

The median (IQR) values of Barthel Indexscore at pretreatment and posttreatment were 7.5 (4.57) and 15 (3.5) points, respectively. See Table (3).

There was significant differences between pre and posttreatment (p-value=0.002) with significant improvement in ADLs posttreatment, See Table (4).

Table (3): Descriptive statistics for Barthel Index at pre and posttreatment in both groups.

Barthel index	Pre Median (IQR)	Post Median (IQR)
Group A	7 (6)	14.5 (4.5)
Group B	7.5 (4.57)	15 (3.5)

Table (4): Within groups differences in Barthel Index.

Pre VS. Post	Test value	*p*-value
Group A	78	0.002*
Group B	78	0.002*

*Significant at alpha level <0.05.

2- *Between group's differences:*

There was non-significant difference between groups postreatment (p-value=0.22), see Table (5).

No significant difference between groups at pretest (p-value=0.89), revealing homogenous groups.

Table (5): Differences between groups in Barthel Index.

Group A VS. Group B	*p*-value
Pre	0.89
Post	0.22

B- Berg balance scale:

1- *Within group's differences:*

a- *Group A (Control):*

The median (IQR) values of Berg balance scale scores at pretreatment and posttreatment were 16 (7) and 30 (8.25) points, respectively. See Table [6].

There was significant differences between pre and posttreatment (p-value=0.002), with significant improvement of balance posttreatment, See Table [7].

b- *Group B (Experimental):*

The median (IQR) values of Berg balance scale score at pretreatment and posttreatment were 18.5 (7) and 30 (10) points, respectively. See Table (6).

There was significant differences between pre and posttreatment (p-value=0.002) with significant improvement of balance posttreatment, See Table (7).

Table (6): Descriptive statistics for Berg balance scalefor both groups.

Berg balance scale	Pre Median (IQR)	Post Median (IQR)
Group A	16 (7)	30 (8.25)
Group B	18.5 (7)	30 (10)

Table (7): Within groups differences in Berg balance scale.

Pre VS. Post	Test value	*p*-value
Group A	78	0.002*
Group B	78	0.002*

*Significant at alpha level <0.05.

2- *Between group's differences:*

There was showed non-significant difference (p=0.63), see Table (6).

No significant difference between groups at pretest (p-value=0.35), revealing homogenous groups.

Table (8): Differences between groups in Berg balance scale.

Group A VS. Group B	p-value
Pre	0.35
Post	0.63

C- Bilateral Quadriceps and dorsiflexors isometric strength:

1- *Within group's differences:*

a- Group A (Control):

The median (IQR) values of Quadriceps isometric strength at pretreatment and post treatment were 0.7 (0.83) and 4.15 (3.25), for right side, and 0.85 (1.03) and 5 (3.38) for left side, respectively. See Table (9).

There was significant differences between pre and post treatment (p-value=0.002) for right side, (p-value=0.002) for left side, with significant increase of Quadriceps isometric strength post treatment, See Table (10).

The median (IQR) values of dorsiflexors isometric strength at pretreatment and post treatment were 0.95 (1.08) and 6.4 (4.25), for right side, and 1.05 (1.45) and 7.4 (2.53) for left side, respectively. See Table (9).

There was significant differences between pre and post treatment (p-value=0.002) for right side, (p-value=0.002) for left side,with significant increase of dorsiflexors isometric strength post treatment, See Table (10).

b- Group B (Experimental):

The median (IQR) values of Quadriceps isometric strength at pretreatment and post treatment were 0.8 (0.75) and 6.75 (3.48), for right side, and 0.95 (1.2) and 7 (2.5) for left side, respectively. See Table (9).

There was significant differences between pre and post treatment (p-value=0.002) for right side, (p-value=0.002) for left side,with significant increase of Quadriceps isometric strength post treatment, See Table (10).

The median (IQR) values of dorsiflexors isometric strength at pretreatment and post treatment were 0.9 (1.48) and 7.2 (3.13), for right side, and 1.25 (1.63) and 6.6 (3.35) for left side, respectively. See Table (9).

There was significant differences between pre and post treatment (p-value=0.002) for right side, (p-value=0.002) for left side,with significant increase of dorsiflexors isometric strength post treatment, See Table (10) and Fig. (5).

Table (9): Descriptive statistics for bilateral Quadriceps and Dorsiflexors isometric strength for both groups.

	Pre Median (IQR)	Post Median (IQR)
Quadriceps isometric strength		
Group A:		
Right	.7 (0.83)	4.15 (3.25)
Left	0.85 (1.03)	5 (3.38)
Group B:		
Right	0.8 (0.75)	6.75 (3.48)
Left	0.95 (1.2)	7 (2.5)
Dorsiflexors isometric strength		
Group A:		
Right	0.95 (1.08)	6.4 (4.25)
Left	.05 (1.45)	7.4 (2.53)
Group B:		
Right	0.9 (1.48)	7.2 (3.13)
Left	1.25 (1.63)	6.6 (3.35)

Table (10): Within group's differences in bilateral Quadriceps and dorsiflexors isometric strength.

Pre VS. Post	Test value	Sig. (2-tailed)
Right Qudriceps:		
Group A	78	0.002*
Group B	78	0.002*
Left Qudriceps:		
Group A	78	0.002*
Group B	78	0.002*
Right Dorsiflexors:		
Group A	78	0.002*
Group B	78	0.002*
Left Dorsiflexors:		
Group A	78	0.002*
Group B	78	0.002*

*Significant at alpha level <0.05.

2- *Between group's differences:*

There was non-significant difference between groups in isometric strength of both muscles groups at both sides post treatment (p>0.14), except for right Quadriceps (p=0.024) was statistically significantly increased in favor of experimental group (B), see Table (11).

No significant difference in isometric strength between groups at pretest (p>0.34), revealing homogenous groups.

Table (11): Differences between groups in isometric strength for Quadriceps and Dorsiflexors at both sides.

Group A VS. Group B	*p*-value
Right Quadriceps:	
Pre	0.41
Post	0.024*
Left Quadriceps:	
Pre	0.41
Post	0.143
Right Dorsiflexors:	
Pre	0.84
Post	0.89
Left Dorsiflexors:	
Pre	0.93
Post	0.55

*Significant at alpha level <0.05.

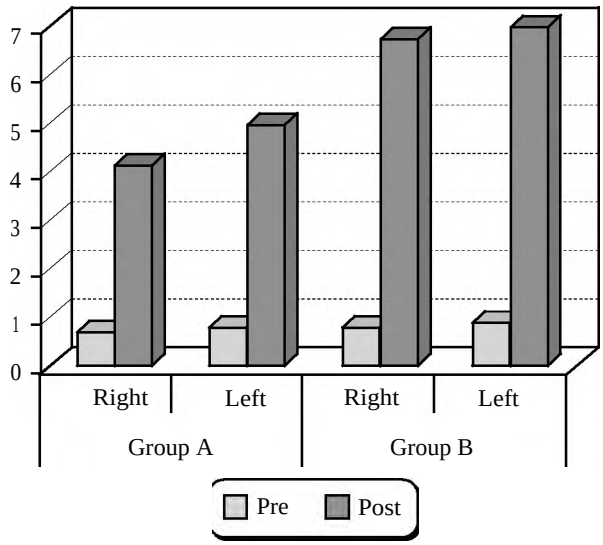

Fig. (5): Chart showing median scores pretest and posttest for Quadriceps isometric strength both sides in both groups.

Discussion

The results of this study failed to accept the general null hypothesis totally, as there were significant difference between groups in right Quadriceps isometric strength (*p*-value=0.05) posttreatment, in favor of experimental group (Russian current plus exercise) and non-significant differences in other side and functional ability. In addition to that, there were significant difference within both groups in all of these outcomes (isometric strength of Quadriceps and, functional ability).

The current study showed that addition of Russian current stimulation in the resistance exercise programhas significant effect in increasing Quadriceps isometric strength than exercise alone, function. This may suggest that Russian current is important in rehabilitation of chronic inflammatory demyelinating polyneuropathy patients with Quadriceps weakness.

It worth noting the experimental group (Russian plus exercise) who hand statistically significant increase in Quadriceps strength also demonstrated more clinical important change in Barthel index of ADLs, but not in Berg balance scale. This may ensure the importance of isometric strength of the Quadriceps muscle and the importance of Russian current not only on improving isometric strength but also improving the ability to do ADLs.

Findings of the present study regarding significant difference between groups in Quadriceps isometric strength and within groups in Quadriceps isometric strength, agree with that of Bickel et al., **[6]** who found that Russian current can offset the effects of arthrogenic muscle inhibition and enhance recovery of strength and neuro-muscular electrical stimulation can facilitate improvements in gait, prevent atrophy following disuse, target improvements in motor control, manage symptoms associated with spasticity, or to make exercise possible.

This may be explained by that the Russian current stimulates nearly all the motor units of muscle to contract synchronously leading to greater muscle hypertrophy. This allows less electrical energy to dissipate peripherally and more electrical energy to penetrate to the muscle and evoke greater fibre recruitment **[11]**.

The mechanism of the increased force generating capacity of the stimulated Quadriceps muscle may be attributed to a short term CNS adaptation [12].

One therapeutic effect of neuro-muscular electrical stimulation (NMES) is motor relearning, which is defined as “the recovery of previously learned motor skills that have been lost following localized damage to the central nervous system [13]. Neuro-muscular electrical stimulation has been shown to be effective in preventing the decreases in muscle strength, muscle mass and the oxidative capacity of thigh muscles (as Quadriceps muscle) following knee immobilization **[14]**.

Findings of the present study regarding statistically significant improvement in muscle strength, function, and balance within both groups posttreatment agree with Hansen **[15]** who said that appropriate exercise is a vital part of any CIDP intervention plan because of its potential to improve strength and endurance, thereby minimizing muscle shrinkage and improving function and mobility.

Due to scarcity of literature in the combined effect of exercise and Russian current stimulation in CIDP, there were no other studies that can be compared with the current study.

Conclusion:

Addition of Russian current stimulation to exercises led to statistical significant increase in Quadriceps strength and clinical improvement in function compared to exercise alone.

References

1- BOZOVIC I., et al.: 'Quality of life predictors in patients with chronic inflammatory demyelinating polyradiculoneuropathy', Journal of Neurology. Springer Berlin Heidelberg, 264 (12): pp. 2481-2486. doi: 10.1007/s00415-017-8658-x, 2017.

2- VALLAT J.M., SOMMER C. and MAGY L.: 'Chronic inflammatory demyelinating polyradiculoneuropathy: Diagnostic and therapeutic challenges for a treatable condition', The Lancet Neurology. Elsevier Ltd, 9 (4): pp. 402-412. doi: 10.1016/S1474-4422(10)70041-7, 2010.

3- HARBO T., et al.: 'Muscle performance relates to physical function and quality of life in long-term chronic inflammatory demyelinating polyradiculoneuropathy', 217: pp. 208-217, 2008.

4- GREER M. and WOLF G.: Diagnosing and treating CIDP. GIPS/CIDP foundation International. retrieved from http://WWW.gps-cidp.org/ ecomm/diagnosing-and treating-cidp/, 2015.

5- ELLRICHMANN G., et al.: 'Two years' long-term follow-up in chronic inflammatory demyelinating polyradiculoneuropathy: Efficacy of intravenous immunoglobulin treatment', Therapeutic Advances in Neurological Disorders, 10 (2): pp. 91-101. doi: 10.1177/1756285616679369, 2017.

6- BICKEL C.S., GREGORY C.M. and DEAN J.C.: 'Motor unit recruitment during neuromuscular electrical stimulation: A critical appraisal', pp. 2399-2407. doi: 10.1007/s00421-011-2128-4, 2011.

7- GABEL C.P., et al.: 'Lower Limb Functional Index: Development and Clinimetric Properties', Physical Therapy, 92 (1): pp. 98-110. doi: 10.2522/ptj.20100199, 2012.

8- DIMITROVA A., et al.: 'Physical Therapy and Functional Motor Recovery in Patient with Guillain- Barré Syndrome - Case Report', 13 (33): pp. 11-19. doi: 10.19044/esj.2017.v13n33p11, 2017.

9- Lafayette Instrument: 'Lafayette Manual Muscle Test System (Mmt)', (765), 2003.

10- COLLIN C., et al.: 'The Barthel ADL Index, a reliability study. Int. Disabil Stud, 10 (2): pp. 61-63, 1988.

11- WARD A.R. and SHKURATOVA N.: '"Russian" Electrical Stimulation', Athletic Therapy Today, 2 (3): pp. 27-27. doi: 10. 1 123/att.2.3.27, 2016.

12- STIMULATION R. and WATSON T.: 'Russian Stimulation / BMAC (c) Tim Watson 2014 Page 1', (c), pp. 1-8, 2014.

13- SHEFFLER L.R. and CHAE J.: 'Neuromuscular Electrical Stimulation In Neurorehabilitation', (May), pp. 562-590. doi: 10.1002/mus.20758, 2007.

14- LAKE D.A.: 'Neuromuscular Electrical Stimulation An Overview and its Application in the Treatment of Sports Injuries', 13 (5): pp. 320-336, 1992.

15- HANSEN M.D.: 'Exercise for CIDP', 2010.

تأثير التيار الروسى والتمرينات العلاجية مقارنة بالتمرينات العلاجية فقط على حالات الاعتلال العصبى متعدد الإلتهابات المزمن

الهدف من البحث: هو معرفة هل هناك فرق بين استخدام التمرينات العلاجية مع التيار الكهربائى الروسى مقارنة باستخدام التمرينات العلاجية فقط فى الوظيفة والاتزان والقوة العضلية فى حالات الاعتلال العصبى متعدد الا لتهابات وتم إجراء البحث على ٢٤ مريض من كلا الجنسين الذين تتراوح أعمارهم بين ٣٠ عاماً قسمت عشوائياً المجموعتين متساوين فى العدد وتلقت المجموعة العلاج بطريقة التمرينات ٥٠ العلاجية فقط وتلقت المجموعة العلاجية بطريقة التمرينات العلاجية والتيار الكهربائى الروسى.

تم تقييم المجموعتين قبل وبعد العلاج على يد مقيم مستقل باستخدام مقياس النشاط اليو مى وجهاز قياس قوة scale Barthel Index ومقياس الاتزان بيرغ Lafayette dynamometer of Activities of Daily living العضلات. تم عمل ثلاث جلسات أسبوعياً ومدة Balance الجلسة تتراوح بين ٥٠ إلى ٦٠ دقيقة لمدة ستة أسابيع.

أظهرت النتائج وجود فرق ذو دلالة إحصائية لقوة العضلة الرباعية للرجل اليمنى تحسن إكلينيكى فى الوظيفة للمجموعة التجريبية مقارنة بالضابط هو عدم وجود فروق ذات (p<0.05) دلالة إحصائية على باقى العوامل قيد الدراسة. وكان هناك فروق ذات دلالة إحصائية لكل العوامل قيد الدراسة داخل المجموعتين بعد العلاج.

ومن ذلك نستنتج أن إضافة التيار الروسى للتمارين العلاجية مفيد فى تقوية العضلات والوظيفة مقارنة أتزان، مقياس النشاط اليومى.