Comparative Study on Russian Current Stimulation Versus Faradic Current in Pain and Functional Outcome in Osteoarthritis Knee

Janani Aishwarya B¹, Kotteeswaran K²

¹Undergraduate, ²Professor, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical sciences, Chennai, Tamil Nadu, India.

How to cite this article: Janani Aishwarya B, Kotteeswaran K. Comparative Study on Russian Current Stimulation Versus Faradic Current in Pain and Functional Outcome in Osteoarthritis Knee. Indian Journal of Physiotherapy and Occupational Therapy / Volume 18, Year 2024.

Abstract

Background: This study was designed to inspect the effectiveness of a comparative study on Russian Current Stimulation versus Faradic Current in pain and functional outcome in osteoarthritis knee. Russian current is the most commonly used electrical stimulation to improve muscle strength. Faradic current is effective in treating muscle spasms caused by inflammation and in lowering pain.

Purpose: To compare the effectiveness of Russian current stimulation versus Faradic current using the KOOS scale.

Materials and Methods: This experimental study has been conducted from November 2022 to April 2023. A total of 196 adults were collected from APR physiotherapy center with OA knee have been selected using the inclusion and exclusion criteria. They have been split into 2 groups Group A (n=98) and Group B (n=98) were assigned. Group A got Russian current stimulation, whereas Group B received Faradic current and the KOOS scale was used to evaluate the subjects. The treatments were given for 5 sessions per week and continued for 4 weeks.

Results: The mean value of Russian current at the post-test was found to be higher than the mean value of Faradic current with a p-value of <0.0001.

Conclusion: The result suggests that Russian current stimulation shows a significant effect in reducing pain in the OA knee when compared to Faradic current.

Key Word: Russian current stimulation, OA knee, KOOS scale, Faradic current.

Introduction

Osteoarthritis is a kind of joint deterioration that causes pain and reduced joint mobility, limiting exercise and quality of life. One of the most serious worldwide health concerns connected with noncommunicable diseases (NCDs) is physical activity, which can lead to osteoarthritis. Although osteoarthritis may affect every joint in the body, including the joints of the arm, shoulder area, elbow, wrist, vertebrae, pelvis, kneecap, and foot, the knee is the most prevalent and vulnerable.² Osteoarthritis (OA), frequently referred to as a degenerative joint condition, primary osteoarthritis, tear, and damage arthritis, or associated with age-related arthritis, is one of the most prevalent causes of disability. The word “arthritis” is frequently employed by

Corresponding Author: K.Koteeswaran, Professor, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Science, Chennai, Tamil Nadu, India.

E-Mail: kotteeswaran.scpt@saveetha.com
physicians to characterize joint inflammation. Knee OA frequently develops gradually over a period of 10 to 15 years. It was thought to be just “wear-and-tear” degeneration of the articular frequently referred to as a degenerative joint condition, primary osteoarthritis, tear, and damage arthritis, or associated with age-related arthritis is one of the most prevalent causes of disability. The word “arthritis” is frequently employed by physicians to characterize joint inflammation. Knee OA frequently develops gradually over a period of 10 to 15 years. It was thought to be just “wear-and-tear” degeneration of articular cartilage caused by becoming older, with no relation to inflammation. Even though the cause of this condition is unknown and being researched, it has been shown that knee OA has a complicated etiology. Genetics, age, weight or obesity, joint inflammation, innate immunity, lower limb alignment, joint development and dysplasia, stress, and swelling produced by metabolic problems are all factors that contribute to knee osteoarthritis. The etiology and pathophysiology of osteoarthritis are complex and poorly understood. Two of the most prevalent risk factors for osteoarthritis are articular cartilage degradation and adaptive subchondral development of bones with moderate joint inflammation. Patients with knee osteoarthritis frequently experience pain that worsens with movement or physical activity, stiffness, swelling, deformity (knock-knee), and restricted walking distance. One of the key elements that have been demonstrated to impact knee joint function is quadriceps strength. Lower extremity strength is important in absorbing shock at the knee joint during weight-bearing activity. The positive predictive value for narrative knee osteoarthritis alone was 94.0% (95% CI [95% CI] 87.4-100%), while it was 96.0% (90.6-100%) for coded knee osteoarthritis between 2008 and 2019, the prevalence rate grew from 1.93 to 2.28 times, with a range of 9.98 to 13.8 per 1,000 person-years.

The Russian current is a medium-frequency electrotherapy approach that is used in conjunction with a sinusoidal alternating current of 25,000 hertz. According to one source, Russian current is the most commonly used electrical stimulation to improve muscle strength.

Faradic current is a direct current used to stimulate innervated muscles that have a short pulse, a pulse width of 0.1 to 1 ms, and a frequency of 50 to 100 Hz. However, it has been shown to be effective in treating muscle spasms caused by inflammation and in lowering pain.

**Aim**

The aim of the study is to compare the effectiveness of a comparative study on Russian Current Stimulation versus faradic current in pain and functional outcome in osteoarthritis knee.

**Materials and Methods**

It was a comparative study conducted on 196 subjects with osteoarthritis knees, aged above 40 years. Convenient sampling with a random allocation method was used in this study.

**Study period:** from November 2022 to April 2023

**Inclusion criteria:**
1. People aged 40 years and above
2. Subjects diagnosed with Knee Osteoarthritis grade I & II based on American College of Rheumatology criteria.
3. Chronic Pain in knee For More than 6 months.

**Exclusion criteria:**
1. Recent Surgery in the Lower Limb.
2. Rheumatoid Arthritis.
3. Patient with Sensory Loss.

**Outcome measures:**
Assessment was performed at baseline (before starting treatment) and after 4 weeks of study.

- Knee Injury and Osteoarthritis Outcome Score(KOOS).

**Procedure**
Participants were included considering the inclusion and exclusion criteria. The procedure was explained to the participant & participants were asked to sign the consent form. Assessment of all the included participants was done according to the assessment form. Participants were randomly divided into two groups. i.e. Group ‘A’ and ‘B’. The assessment was performed at baseline and after 4 weeks of study.
**Group A: Russian Current**

The participants were given Russian current. During the application, a Hot pack is given to the subjects to reduce pain, and a gel was used for the transmission of Russian current on the subject's skin. The treatment was provided by placing the electrodes around the knee at the frequency of 50Hz, 2.5KHz AC, Intensity of 2.5KHz AC, Mode–Burst, Duration of 10 seconds on followed by 50 seconds off for 10 minutes. Given for 10 minutes; 5 sessions per week.

**Group B: Faradic Current**

The participants were given Faradic current. During the application, a Hot pack is given to the subjects to reduce pain, and the gel was used for the transmission of faradic current on the subject's skin. The treatment was provided by placing the electrodes around the knee at the frequency 80Hz, Pulse Duration of 400 μs Duration of 10 seconds of stimulation followed by 20 seconds of rest for 30 minutes. Given for 10 minutes; 5 sessions per week.

**Strengthening Exercises.**

**Isometric quadriceps exercise**

The quadriceps femoris isometric exercise was performed in the supine position lay on their backs with a towel roll placed under their knees; they were educated to press their knees against the roller. The quadriceps femoris were strengthened for the exercise. was asked to use the thigh to engage as much muscle as possible to keep the knee straight. This exercise was performed in 3 sets of 10 reps.

**Isometric hip adduction exercise.**

In isometric hip adduction exercise, Patients lie supine with a cushion between their knees for the isometric hip adduction exercise. They are instructed to do isometric hip adduction, place a cushion between their legs, and hold the adduction position for 5 long seconds.

**Straight leg raising (SLR) exercise**

The single leg raise (SLR) exercise was performed while lying down. The patients were asked to attempt a maximal isometric contraction of the quadriceps femoris before the lifting phase (SLR), then raise the leg 10 cm up the socket and then sustain the contraction for 10 seconds.

**Data Analysis**

Using tabular and inferential statistics, the gathered data was evaluated. The mean and standard deviation (SD) were utilized for all parameters. The statistically significant differences between pre-test and post-test measures were examined using a paired t-test. When utilizing the unpaired t-test to look at significant changes in the experimental group. The significance level of p < 0.0001 was determined to be statistically significant.

![Graph No. 1](image)

**Graph No. 1:**

Graph No 1. Comparison of pre-test and post-test values of Russian current stimulation using the KOOS scale.
**Graph No. 2:**

Graph No 2. Comparison of pre-test and post-test values of Faradic current using KOOS scale.

**Graph No. 3:**

Graph No.3 Comparison of post-test values of Russian current and Faradic current using the KOOS scale.

**Results**

A statistical analysis of data revealed a statistically significant difference in values between the Russian current stimulation group and the Faradic current stimulation group.

**Table-1** compares the pre-test and post-test values of Russian current stimulation using the KOOS scale. The mean value of Russian current stimulation in the experimental group using the Koos scale, the value of pain mean pre-test (21.83) and post-test (60.57) and pain SD pre-test (4.02) and post-test (3.88), symptoms mean pre-test (20.96) and post-test (63.77), and symptoms SD pre-test (5.16) and post-test (5.02) and ADL mean pre-test (24.57) and the post-test(64.29) and ADL SD pre-test(2.89) and the post-test(3.03) and Sports mean pre-test (22.76) and the post-test (65.00) and SD pre-test (8.68) and the post-test(7.14) and QOL mean pre-test (30.93) and post-test (65.63) and QOL SD pre-test (8.81)and the post-test (7.08). As a result, the findings are considered statistically significant when the p-value is <0.0001.
Table – 2 compares the pre-test and post-test values of Faradic current stimulation using the KOOS scale. The mean value of Faradic current stimulation in the experimental group. Using the Koos scale pain mean pre-test (21.83) and post-test (42.68) and pain SD pre-test (4.02) and post-test (3.37), symptoms mean pre-test (20.96) and post-test (42.4), and symptoms SD pre-test (5.16) and post-test (2.86) and ADL mean pre-test (24.57) and the post-test (43.13) and ADL SD pre-test (2.89) and the post-test (5.14) and Sports mean pre-test (22.76) and the post-test (39.8) and SD pre-test (8.68) and the post-test (8.81) and QOL mean pre-test (30.93) and post-test (39.69) and QOL SD pre-test (8.81) and the post-test (3.04). As a result, the findings are considered statistically significant when the p-value is <0.0001.

Table – 3 compares the post-test values of the Russian current stimulation group and Faradic current stimulation groups, revealing that the Russian group’s mean of pain pre-test (60.57) and post-test (42.68) and pain SD pre-test (3.88) and post-test (3.37), symptoms mean pre-test (63.77) and post-test (42.4), and symptoms SD pre-test (5.02) and post-test (2.86) and ADL mean pre-test (64.29) and the post-test (43.13) and ADL SD pre-test (3.03) and the post-test (5.14) and Sports mean pre-test (65) and the post-test (39.8) and sports SD pre-test (7.14) and the post-test (4.06) and QOL mean pre-test (65.63) and post-test (39.69) and QOL SD pre-test (7.08) and the post-test (3.04). As a result, the findings are considered statistically significant when the p-value is less than <0.0001.

This shows that the Russian current stimulation produces better functional results in the Russian current stimulation group than the Faradic current stimulation group.

Discussion

The purpose of this study was to compare the effectiveness of Russian current stimulation and if it shows a significant effect in reducing OA knee when compared to Faradic current in subjects with OA knee pain.

In this study, 196 subjects were assigned, 98 were in Group A and 98 in Group B. Group A received Russian current 5 sessions/week, and Group B received Faradic current 5 sessions/week for a duration of 4 weeks. Both these groups received hot packs before the treatment.

The outcome measures were the KOOS Scale performed at baseline and after 4 weeks of study.

According to Graph no.3, the present study shows improvement in both the groups’ i.e. Russian current and faradic current for all measured variables but Russian current shows more effectiveness in reducing pain and improving functional outcome.

The most common cause of disability is osteoarthritis (OA), which affects at least 12-16% of the population. Furthermore, as a result of the obesity epidemic and aging, the prevalence of osteoarthritis is rapidly increasing. Although knee osteoarthritis is common, there is no cure and only a few non-surgical treatments exist to slow the disease’s progression. The pathogen’s disease progression distinguishes primary arthrosis from secondary arthrosis. Subchondral bone modifications include gradual expansion of the subchondral plate, Trabecular bone refers to alterations in the subchondral architecture of the bone and the development of new bone at the joint edges. Furthermore, changes in articular cartilage composition and shape induce chondrocytes to create more metabolic chemicals implicated in cartilage degradation. Pain and increased intra-articular fluid, which are frequent in OA, intensify areola mechanoreceptors, which activate inhibitory interneurons in the spinal cord, limiting muscle activation. Chronic pain, inflammatory phenotypes, phenotypes connected to bone and cartilage metabolism alterations, metabolic syndrome, mechanical phenotypes, and limited joint damage are all associated with knee OA. The mechanical formation of the knee arthrosis type is triggered by mechanical stress and earlier trauma.

Heggannavar AB et al. concluded that Russian current stimulation is effective in increasing quadriceps muscle strength and thereby improving the functional ability in subjects with primary osteoarthritis of the knee.

Hadeer Nabil et al. concluded that faradic stimulation improved quadriceps muscular strength.
while decreasing pain and functional impairment in Osteoarthritis knee subjects.\textsuperscript{17}

Zeng C et al. concluded that Russian current is more beneficial for pain relief in knee osteoarthritis: systematic review and network meta-analysis.\textsuperscript{18}

**Conclusion**

In conclusion, this study provides evidence that Russian current is useful as a therapeutic technique for Osteoarthritis knee. The findings demonstrate significant improvements in pain relief and functional outcomes following intervention. These positive outcomes align with recent research emphasizing the benefits of Russian current. Russian currents show a potential increase in relieving pain and improving functional outcomes. Further research and long-term follow-up studies are necessary to validate these results and assess the long-lasting effects of Russian current in the management of Osteoarthritis Knee.

**Ethical clearance:** The ISRB committee of a private hospital and institution in Chennai has provided its clearance for the conduct of human research that complies with all applicable national laws, and institutional regulations. (ISRB number-03/030/2022/ISRB/SR/SCPT)

**Funding:** This study is a self-funded study.

**Conflict of interest:** Nil

**Reference**


13. Doma k, grant a, morris j. The effects of balance training on balance performance and functional outcome measures following total knee arthroplasty: a


