

Compare the Effect of Surged Faradic Current and Interferential Therapy Along with Ischemic Compression on Pain in Young Adults with Active Myofascial Trigger Points of Rhomboid Muscle: A Comparative Study

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Abstract: This comparative study evaluated the effect of Surged Faradic Current (SFC) and Interferential Therapy (IFT), both combined with Ischemic Compression Therapy (ICT), on pain in young adults with active myofascial trigger points of the rhomboid muscle. A randomized clinical trial was conducted among 46 young adults aged 20–40 years, with 23 participants allocated to Group A (SFC + ICT) and 23 to Group B (IFT + ICT) using simple random sampling. Pain intensity was assessed using the Numeric Pain Rating Scale (NPRS) before and after intervention. The Shapiro–Wilk test was used to assess normality, followed by the Wilcoxon signed-rank test for within-group comparisons and the Mann–Whitney U test for between-group comparison. Group A showed a mean NPRS reduction of 4.22 points, from 5.65 ± 0.98 to 1.43 ± 0.79 , while Group B showed a mean reduction of 4.30 points, from 5.39 ± 0.94 to 1.09 ± 0.85 . Both treatment approaches were associated with significant within-group reductions in pain. The between-group comparison did not show a statistically significant difference ($p = 0.854$). The findings indicate that both combined treatment approaches may be useful in the physiotherapeutic management of pain associated with active rhomboid myofascial trigger points.

Keywords: Electrotherapy; Interferential Therapy; Ischemic Compression; Myofascial Trigger Point; Numeric Pain Rating Scale; Pain; Rhomboid Muscle; Surged Faradic Current.

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I. INTRODUCTION

Myofascial pain syndrome is defined by the presence of myofascial trigger points (MTrPs), which are hypersensitive spots found within taut bands of skeletal muscle. These points are painful on compression and may cause referred pain, restricted movement, and autonomic (vegetative) responses. Trigger points are classified as active or latent. Active trigger points are capable of producing pain both at rest and during activity of the involved muscle. ⁽¹⁾

According to Travell and Simons, a latent trigger point does not produce pain but may contribute to restricted movement and muscle weakness. The most widely accepted

hypothesis attributes this to dysfunctional motor endplates, which result in sustained muscle shortening. Additionally, disruption of the sarcoplasmic reticulum—causing excessive calcium release—has been proposed as a contributing factor. Another theory suggests that MTrPs arise in regions of muscle with reduced energy supply and increased metabolic demand. Furthermore, abnormal spontaneous electrical activity has been observed at motor endplates, supporting the role of neuromuscular dysfunction in trigger point formation. ⁽¹⁾

The major diagnostic criteria for MTrPs include: Localized, spontaneous, chronic pain Presence of tender points in muscle (likely to be trigger points) Absence of non-

muscular tender points, which may instead represent referred pain from trigger points. A palpable taut band along the length of the muscle. Reduced range of motion⁽²⁾

The minor diagnostic criteria are: Reproduction of spontaneous pain after repeated pressure over the trigger point. Relief of pain following muscle stretching or injection into the muscle.

Additionally, the “jump sign” is considered characteristic of MTrPs. It refers to the patient’s involuntary pain response—such as wincing, crying out, or withdrawing—when pressure is applied to a trigger point⁽¹⁾ managing myofascial trigger points because of its simplicity, safety, and effectiveness. In this method, the therapist gradually applies pressure to the trigger point until the patient reports the onset of discomfort or pain. The pressure is then maintained until muscle tension decreases, pain subsides, or approximately one minute has passed—whichever occurs first. After this, the pressure is increased again until discomfort reappears. This cycle is typically repeated 3–4 times within a 90-second period.

The applied pressure helps reduce muscle tone, enhance local blood flow, and relieve the peripheral energy crisis⁽³⁾

The therapeutic procedure of ischemic compression (IC) involves gradually increasing pressure on myofascial trigger point (MTrPs) until the patient reaches their pain threshold. This pressure is then maintained until the touch and pressure receptors become habituated. During this process, compression and vasoconstriction induce temporary ischemia in targeted tissues. This brief disruption of homeostasis triggers secondary hyperemia, as the blood vessels reflexively dilate, enhancing blood flow to the treated area.⁽⁴⁾

Electrical muscle stimulation (EMS) using surged faradic current involves applying an electrical current to elicit muscle contractions. In recent years, EMS has been widely used in orthopedic and neuromuscular rehabilitation.

The technique helps to relax muscle spasms and is also believed to stimulate the production of endorphins, the body’s natural pain-relieving chemicals, which are normally released in response to painful stimuli.⁽²⁾

Surging refers to the gradual increase and decreases of the peak intensity of a current. Faradic current is a short-duration, interrupted electrical current that can be surged to produce near-tetanic muscle contractions and relaxations during treatment.

These rhythmic contractions stimulate the veins and lymphatic vessels within and around the muscle, promoting fluid movement. The valves in the veins ensure that blood is transported toward the heart. When the contractions are strong enough to generate joint movement, they also create a pumping effect, enhancing both venous and lymphatic return.⁽⁵⁾

Interferential Therapy (IFT) is a widely used electrotherapeutic technique for pain management. It involves the interaction of two medium-frequency electrical currents (typically between 1–10 kHz) that combine to create a new current with a low-frequency amplitude modulation (below 1 kHz).

The therapy is administered transcutaneously through electrode pads using either a bipolar method where two pads deliver current and modulation occurs within the stimulator or a quadripolar method where four pads are used and interference occurs within the tissues. Although the precise mechanism by which IFT reduces pain is not fully understood, it is believed that varying the amplitude modulation frequency (AMF) can selectively stimulate large or small diameter afferent nerve fibres, contributing to its analgesic effects.⁽⁸⁾

The rhomboids, consisting of the rhomboid major and minor muscles, play a key role in upper limb movement and in stabilizing both the scapula and the shoulder girdle. They are innervated by the dorsal scapular nerve and receive their blood supply from the dorsal scapular artery.⁽⁷⁾

➤ *ORIGIN:(Rhomboid Minor)*

- Nuchal ligaments and spinous processes of C7 to T1 vertebrae
- Medial border of scapula, at the level of spine of the scapula

ACTION: Retracts the scapula towards the vertebral column, Active Myofascial Trigger Point elevates the scapula

ORIGIN:(rhomboid major) Spinous processes of T2-T5 vertebrae

INSERTION: Medial border of scapula, below the spine of scapula

Poor posture can lead to dysfunctional muscle tone in the cervico-thoracic region, including the rhomboid major and minor muscles. Abnormal postural patterns place stress on muscles and articulating surfaces, such as the cervical (C4–C5) and thoracic (T4–T5) nerves, resulting in muscular imbalance, pain, and restricted range of motion (ROM).⁽⁷⁾

Myofascial pain can arise from multiple factors, including poor posture, altered biomechanics, lack of exercise, psychosocial influences, and acute or repetitive trauma.

Joint dysfunctions also contribute to the development of myofascial trigger points (MTrPs). When trigger points form in the rhomboid muscles, pain is typically experienced along the medial border of the scapula, sometimes accompanied by snapping, grinding, or crunching sounds during scapular movement. Correcting thoracic spine joint dysfunctions can have a positive effect in alleviating trigger points in the rhomboid muscles.

➤ *Need of the Study*

Myofascial trigger points (MTrPs) are a common musculoskeletal problem characterized by localized

tenderness, hypersensitivity, and pain arising from taut bands of skeletal muscle. Active myofascial trigger points can produce pain at rest and during activity, potentially affecting muscle function, movement, and daily activities. The rhomboid major and minor muscles play an important role in scapular retraction, stabilization, and maintaining proper shoulder girdle alignment. Dysfunction of these muscles may contribute to interscapular pain, impaired scapular control and difficulty performing functional activities involving the upper limb. The increasing use of smartphones, computers, and prolonged sitting has contributed to sustained postural demands and poor ergonomic habits.

These factors may place repeated mechanical stress on the cervicothoracic region and periscapular muscles, including the rhomboids. Individuals experiencing active trigger points in the rhomboid muscles may report pain along the medial border of the scapula, discomfort during reaching and lifting, and difficulty maintaining an upright posture. Therefore, effective physiotherapy management is important for reducing pain and improving functional muscle performance.

Combined Effect of Ischemic Compression with SFC and IFT - Ischemic Compression Therapy, when combined with Surged Faradic Current (SFC) or Interferential Therapy (IFT), may help reduce myofascial trigger point pain and tenderness. ICT may provide localized mechanical and sensory effects, while SFC may support muscle activation and circulation, and IFT may contribute to pain modulation. The combined treatment approach may have contributed to the significant reduction in NPRS in both groups. However, the independent contribution of each modality cannot be confirmed

➤ *Aim and Objectives Aim*

To compare the Effect of Surged Faradic Current and Interferential Therapy Along with Ischemic Compression on Pain in Young Adults with Active Myofascial Trigger Points of the Rhomboid Muscle.

➤ *Objectives*

- To compare the effect of Surged Faradic current and Interferential therapy along with Ischemic Compression on active myofascial trigger point among young adults by using NPRS.
- To determine the effect of Surged Faradic current on active myofascial trigger point on pain in Rhomboid muscle among young adults by using NPRS.
- To determine the effect of Interferential current on active myofascial trigger point on pain in Rhomboid muscle among young adults by using NPRS.

➤ *Hypothesis*

• *Alternative Hypothesis*

- ✓ Surged faradic current is more effective than Interferential Therapy on active myofascial trigger point among young adults.

- ✓ Interferential therapy is more effective than surged faradic current on active myofascial trigger point among young adults.

• *Null Hypothesis*

There is no significant difference between the effect of surged faradic current and Interferential therapy on active myofascial trigger point among young adults.

II. MATERIALS AND METHODOLOGY

MATERIALS

- Pen
 - Paper
 - Consent form
 - Treatment couch
 - Electrical muscle stimulator
 - IFT
 - Mackintosh
 - Lint pad
 - Electrodes
 - Straps
 - Cotton
 - Powder
 - Aquasonic gel
- ### METHODOLOGY
- STUDY TYPE: Comparative Study
 - STUDY DESIGN: Randomized Clinical Trail
 - SAMPLE SIZE: 46

- ✓ Group (A)-23
- ✓ Group (B)-23 Calculated by Minimum Sample Size

- (N)-Estimating DIFFERENCE BETWEEN TWO MEANS
- SAMPLE TECHNIQUE: Simple random sampling
- STUDY POPULATION: Young adults with age group between 20 to 4 years.
- STUDY DURATION: 6 months
- STUDY SETTING: Urban Population, Jalgaon Selection Criteria

➤ *Inclusive Criteria:*

- Both gender male and female with age group 20-40 years
- Participant able to follow the assessment and treatment protocol
- Participant willing to participate in study
- Presence of palpable taut band and hypersensitive spot in the rhomboids muscle.

➤ *Exclusive Criteria:*

- History of recent trauma and fracture
- Other neurological or musculoskeletal conditions causing similar pain
- Surgery or open wounds in the neck and shoulder region within past one year.
- Skin disease and lesion in the area of rhomboids.

➤ Outcome Measure

- **NUMERIC PAIN RATING SCALE:** The Numeric Pain Rating Scale (NPRS) is a simple, quick, and reliable tool for assessing pain intensity in adults, particularly those with chronic conditions such as rheumatic diseases. Its easy format and flexibility for both verbal and written administration make it widely accepted by clinicians and patients. Although the NPRS offers clarity and minimal challenges with language translation, its main limitation is that it only measures pain intensity and does not capture the complex, multidimensional nature of pain. Despite this, its strong psychometric qualities—high reliability, validity, and sensitivity to clinically meaningful changes—make the NPRS a valuable and widely used outcome measure in pain assessment.
- High test–retest reliability has been observed in both literate and illiterate patients with rheumatoid arthritis ($r = 0.96$ and 0.95 , respectively) before and after medical consultation. The consistency of the NPRS has also been validated across various studies involving different patient demographics, ensuring its reliability across diverse populations.
- For construct validity, the NPRS was shown to be highly correlated with the VAS in patients with rheumatic and other chronic pain conditions (pain > 6 months): correlations range from 0.86 to 0.95 . Additionally, the NPRS demonstrates strong correlation validity with other established pain measurement scales, making it a reliable tool for clinical assessments.

➤ Procedure

To conduct the following study, approval was taken from institutional ethical committee of Dr. Ulhas Patil College of Physiotherapy, Jalgaon.

A brief demographic data of all patients was obtained and a written consent was taken from all participants, and the treatment protocol will be explained by the therapist.

Baseline measurement was taken for active myofascial trigger point by numeric pain rating scale.

Participants in group A received an intervention surged faradic current along with ischemic compression and group B received an intervention IFT along with ischemic compression.

Pain was re-evaluated after 2 weeks of intervention.

The collected data were analyzed by using statistical tests and results was generated.

➤ Intervention

• Intervention Group A:

- ✓ Participants of group A was receiving Surge faradic current on active myofascial trigger point in rhomboids muscle. □ Preparation Of Treatment Tray

- ✓ Mackintosh – Kept Under Patient Treatment Part to Prevent Earth Shock and To Prevent Dripping of Water
- ✓ Lint Pad- Is Made up of Lint Cloth and It Is Used to Prevent Accumulation of Chemical in the
- ✓ Tissue Formed During the Treatment. It must be 8 or 16 layers. More The layers Of Lint pad, Less the Chance of Accumulation of Chemicals and Less Chances of Burn.
- ✓ Electrodes- could be pad type or pen type. pad electrode kept in between the lint pad for even distribution of current. It should be smaller than lint pad so that it cannot come in contact of skin. Pen Electrode is used for smaller muscles and specific motor.
- ✓ Leads-Used to connect the electrodes with the stimulator
- ✓ Straps - It should be placed over the pad.
- ✓ Cotton-Used to prevent dripping of water and cleaning the surface.
- ✓ Powder-Used to apply over the skin if there is any redness after the treatment, it gives soothing effect.
- ✓ Gel -Used for pad electrodes where lint pad is not used. gel is used for proper contact. Equipment: Surged Faradic Stimulator
- ✓ Patients position: Participant seated comfortably, upper back exposed.
- ✓ Electrode placement: • Active electrode over trigger point in the rhomboid. • Dispersive electrode placed proximally. • Protocol for Strong Surge Faradic Current in which frequency- is 100Hz of Pulse width - • 0.7msec, surge duration - 0.1-1msec sec with 20 no. of contraction with intensity which produces visible contraction. • Dosage: 3 sessions per week for 2 weeks.

• Group B Intervention-

- ✓ Participant of Group B receive Interferential Therapy on active myofascial trigger point in rhomboid muscle. • Method of Treatment- • 1]skin must be clean and clear before start the treatment. • 2]the electrodes should be placed in such a way that crossing point of two current lie above or around the affected part • Patient position – prone or sitting with forward flexed trunk • Scapula should be slightly abducted to expose rhomboid region • Electrode Placement; • Quadripolar technique –placed 4 electrodes around the rhomboid trigger point area forming across pattern • The point of interference should lie directly over the active trigger point • Use pre modulated IFT • Protocol for Interferential Therapy with Frequency 1 channel delivered sinusoidal 'carrier current is 4000Hz and other channel delivered current at a frequency 4100Hz
- ✓ Amplitude modulated interference wave of 100Hz [beat frequency] • Sweep mode – 10-100Hz • Intensity-increase gradually until patient feels muscle contraction • Duration – 15-20min per session Dosage – 3 session per week for 2 weeks.

• Ischemic Compression Therapy

All participants of Group A and Group B was receiving Ischemic compression therapy on active myofascial trigger point in rhomboids muscle • Patient Position -Participants were prone position on a table, upper back exposed. • Therapist Position- Beside the patient • Procedure –The

intervention involved applying ischemic compression (IC) to the four most • painful trigger points identified for each individual. Pressure was gradually increased until the • participant reached their maximum tolerable pain level, and this pressure was maintained for 90sec. • Dosage- The treatment was administered twice weekly over a period of four weeks, totaling eight sessions.

➤ Statistical Analysis

- The data were analyzed using GraphPad Prism software.

- A total of 46 participants were included, with 23 participants in each group.
- The Shapiro–Wilk test was used to assess data normality.
- As the data were non-normally distributed, non-parametric tests were used.
- The Wilcoxon signed-rank test was used for within-group comparison.
- The Mann–Whitney U test was used to compare changes between the two groups.
- A p-value < 0.05 was considered statistically significant.
- Group A: NPRS decreased by 4.22 points ($p = 0.00002$).
- Group B: NPRS decreased by 4.30 points ($p = 0.000023$).

III. RESULTS

Table 1 Age-Wise Distribution

Age group	Group A (SFC + ICT)	Group B (IFT + ICT)
20–30 years	20 (87%)	20 (87%)
31–40 years	3 (13.0%)	3 (13.0%)
Total	23 (100%)	23 (100%)

The age-wise distribution showed that 40 participants (87%) belonged to the 20–30 years age group, whereas 3 participants (13.0%) belonged to the 31–40 years age group. Thus, the study sample predominantly consisted of young adults aged 20–30 years.

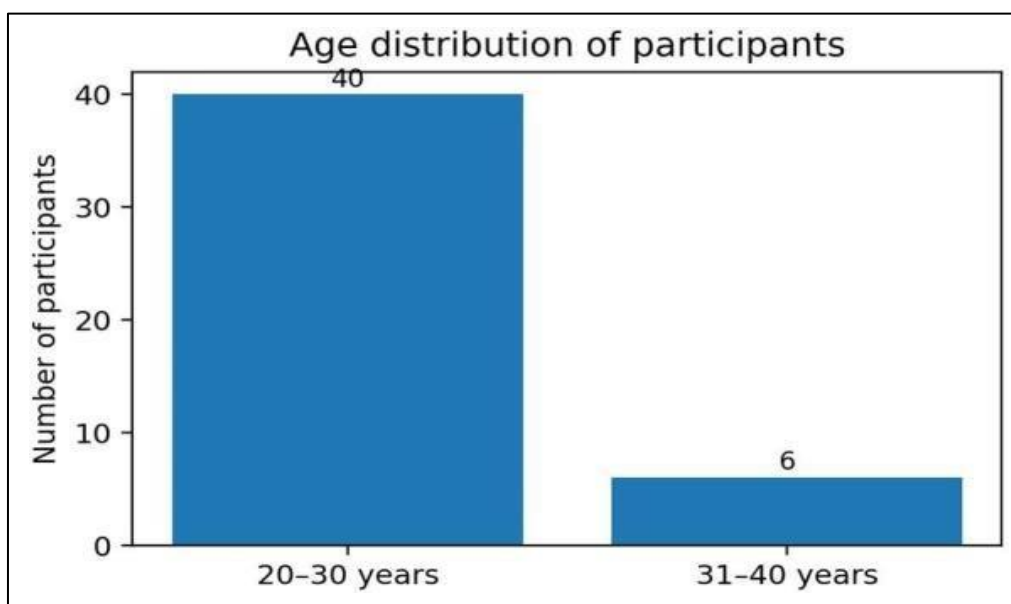


Fig 1 Age Distribution of Participants.

Table 2 Gender-Wise Distribution

Gender	Group A	Group B
Female	14 (60.9%)	19 (82.6%)
Male	9 (39.1%)	4 (17.4%)
Total	23 (100%)	23 (100%)

The gender-wise distribution indicated that, among the 46 participants, 33 (71.74%) were female and 13 (28.26%) were male, demonstrating a higher representation of female participants in the study.

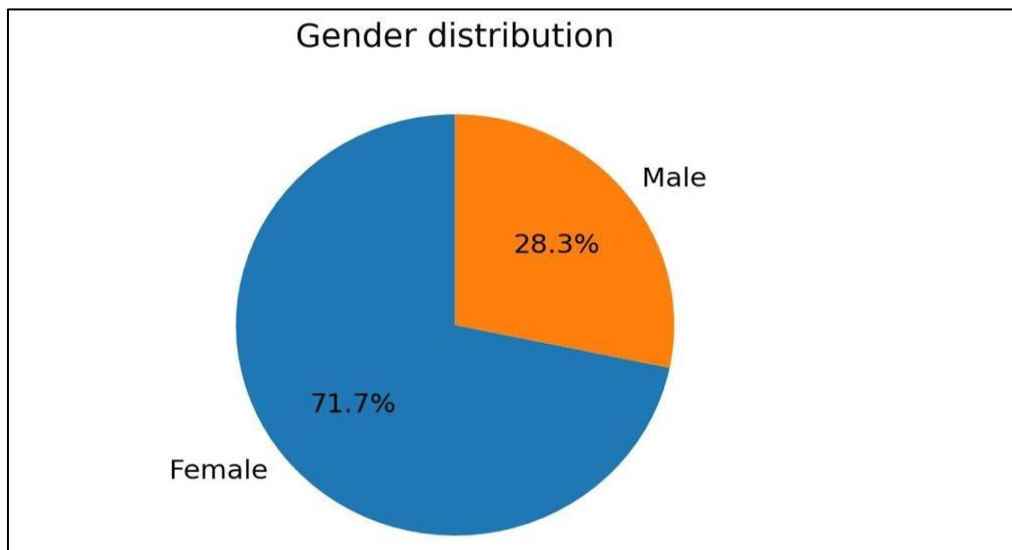


Fig 2 Gender Distribution of Participants

Table 3 Descriptive Statistics for Group A

Measure	Value
Pre-treatment NPRS	5.65 ± 0.98
Post-treatment NPRS	1.43 ± 0.79
Mean reduction	4.22 points (74.6%)
Reported p-value	0.0029
Within-group interpretation	Statistically significant improvement (p < 0.001)

The mean NPRS score decreased from 5.65 ± 0.98 before treatment to 1.43 ± 0.79 after treatment. The mean reduction was 4.22 points (74.6%). The Wilcoxon signed-

rank test showed a statistically significant improvement (p < 0.001). Therefore, SFC/EMS combined with ICT was effective in reducing pain.

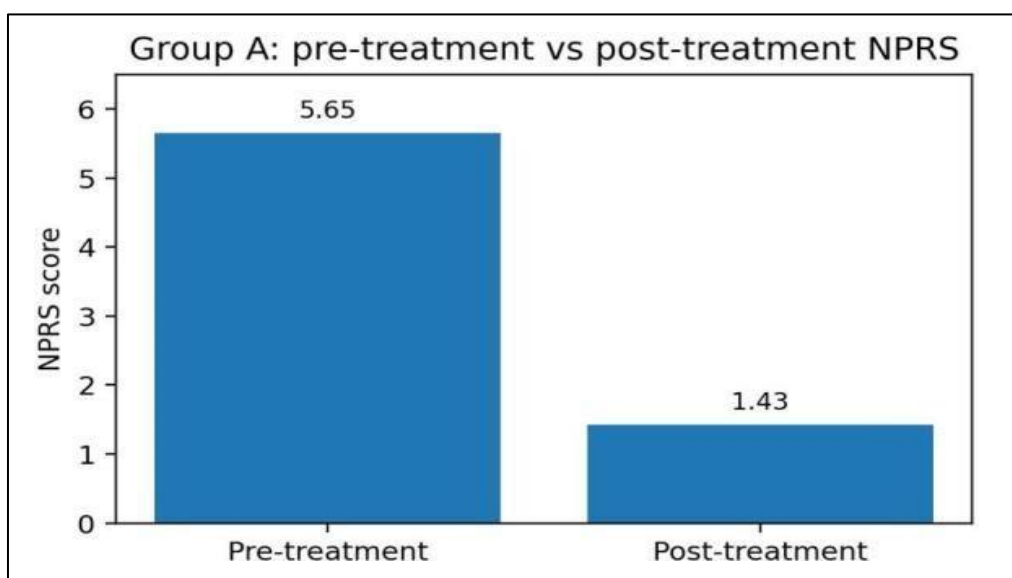


Fig 3 Comparison of Mean NPRS before and after Treatment in Group A.

Table 4 Descriptive Statistics for Group B

Measure	Value
Pre-treatment NPRS	5.39 ± 0.94
Post-treatment NPRS	1.09 ± 0.85
Mean reduction	4.30 points (79.8%)
Reported p-value	0.1246
Within-group interpretation	Statistically significant improvement (p < 0.001)

The mean NPRS score decreased from 5.39 ± 0.94 before treatment to 1.09 ± 0.85 after treatment. The mean reduction was 4.30 points (79.8%). The Wilcoxon signed-

rank test showed a statistically significant improvement ($p < 0.001$). Therefore, IFT combined with ICT was also effective in reducing pain.

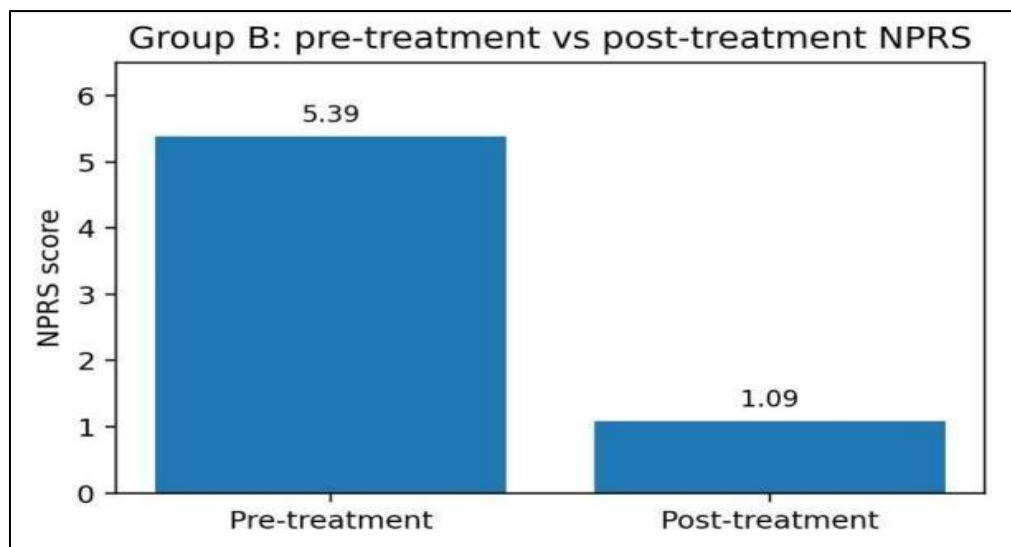


Fig 4 Comparison of Mean NPRS before and after Treatment in Group B.

Table 5 Between-Group Comparison

Measure	Group A	Group B	Reported p-value
Mean NPRS reduction	4.22	4.30	0.05

Although Group B showed a slightly greater numerical reduction in NPRS (4.30 vs 4.22 points), the Mann–Whitney U test showed no statistically significant difference between the two groups ($p = 0.854$).

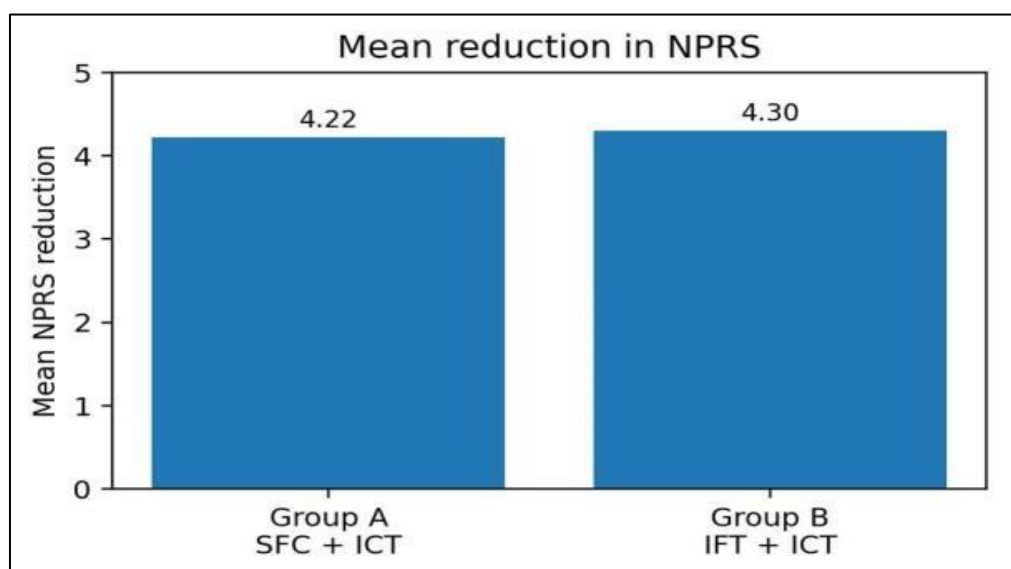


Fig 5 Mean Reduction in NPRS in Group A and Group B

IV. DISCUSSION

The present study compared the effects of Surged Faradic Current with Ischemic Compression Therapy (SFC + ICT) and Interferential Therapy with Ischemic Compression Therapy (IFT + ICT) on pain in young adults with active myofascial trigger points of the rhomboid muscle. In Group A, the mean NPRS score decreased from 5.65 ± 0.98 before treatment to 1.43 ± 0.79 after treatment, with a mean

reduction of 4.22 points. In Group B, the mean NPRS score decreased from 5.39 ± 0.94 to 1.09 ± 0.85 , with a mean reduction of 4.30 points. • The within-group analysis showed a statistically significant reduction in pain in both groups, with $p = 0.00002$ for Group A and $p = 0.000023$ for Group B. • The effect size was large in both groups ($r = 0.878$), indicating a substantial change in NPRS following treatment. However, comparison of the change scores between groups showed no statistically significant difference ($p = 0.854$).

Although Group B showed a slightly greater numerical reduction in NPRS, this difference was not statistically significant. Therefore, the present study demonstrates that both combined treatment approaches were associated with significant pain reduction, without a significant difference between them. The improvement in both groups can be clinically explained by the combined effects of electrotherapy and ischemic compression. In the present study, ischemic compression was provided to both groups, targeting the most painful active trigger points. Sustained pressure applied to the trigger point may reduce local tenderness and pain sensitivity and may improve the mechanical properties and tolerance of the involved muscle. This common intervention could therefore have contributed substantially to the improvement observed in both groups. In addition, SFC and IFT may provide different but complementary therapeutic effects. Surged Faradic Current produces rhythmic muscle contractions, which may assist muscle activation and circulation around the affected region. Surged Faradic Current stimulates sensory and motor nerves, producing mild prickling and rhythmic muscle contractions. This may cause superficial vasodilation, improve local circulation, reduce muscle spasm, and thereby help decrease pain and tenderness associated with myofascial trigger points.

IFT is primarily used for pain management and may produce an analgesic response through stimulation of sensory nerve fibers. Thus, SFC + ICT may reduce pain through muscular stimulation together with trigger-point compression, whereas IFT + ICT may provide analgesia together with the effects of trigger-point compression. Since both groups received ICT, the overall improvement may reflect the combined treatment effect rather than the isolated effect of either electrical modality. The very similar mean reductions of 4.22 and 4.30 points may explain why a statistically significant difference was not observed between groups. • Dissanayaka et al. (2016), who investigated standard care alone, standard care combined with TENS and standard care combined with IFT in patients with upper trapezius myofascial pain syndrome. Their study reported improvements in pain and cervical range of motion with IFT in comparison with standard care. However, the results also demonstrated that the effects of electrotherapy modalities may differ according to the outcome assessed and the treatment parameters used. • Shetty and Raj (2017) studied surged faradic current combined with manual pressure release in participants with upper trapezius myofascial trigger points. Their findings demonstrated significant improvement in pain and cervical movement within the treatment groups, although the between-group difference was not statistically significant. These findings provide support for the potential role of surged faradic stimulation in reducing symptoms associated with myofascial trigger point. • Bhanushali et al. (2023) compared strong surge faradic stimulation with muscle energy technique in individuals with upper trapezius trigger points. Both interventions produced improvements in pain and functional outcomes, with their study reporting greater improvement in the group receiving strong surge faradic stimulation. These findings provide a possible explanation for improvement observed in the SFC group of the present study. However, direct comparison should be made cautiously

because previous studies primarily investigated the upper trapezius, whereas the present study focused specifically on active MTrPs of the rhomboid muscle.

V. CONCLUSION

The present study was conducted to compare the effects of Surged Faradic Current and Interferential Therapy, both combined with ischemic compression therapy, on active myofascial trigger points of the rhomboid muscle among young adults. Based on the findings of the study, both treatment approaches produced changes in pain intensity as assessed by the Numeric Pain Rating Scale. The results indicate that the combination of electrotherapy with ischemic compression may be useful as a physiotherapeutic approach for the management of pain associated with active rhomboid myofascial trigger points. There was no statistically significant difference between Surged Faradic Current combined with ischemic compression therapy and Interferential Therapy combined with ischemic compression therapy in reducing pain intensity. There was a statistically significant difference between the two treatment approaches in reducing pain intensity, with the treatment group demonstrating the greater reduction in NPRS showing a greater effect in the present study.

VI. LIMITATIONS

- Factors such as posture, daily activities, occupational demands, stress, sleep and physical activity may influence myofascial pain and could not be completely controlled.
- Single outcome measure - Only NPRS was used, which assessed pain intensity but not functional disability, pressure pain threshold, ROM, or muscle performance.
- Small sample size of 46 participants.

FUTURE SCOPE

Future research should include a long-term follow-up to determine the persistence of treatment effects and recurrence of myofascial trigger points.

CLINICAL IMPLICATION

The findings indicate that both Surged Faradic Current combined with Ischemic Compression Therapy and Interferential Therapy combined with Ischemic Compression Therapy may be considered as physiotherapeutic approaches for reducing pain associated with active myofascial trigger points of the rhomboid muscle. The interventions may be incorporated into physiotherapy pain-management programs when clinically appropriate. Because no statistically significant difference was found between the two combined approaches, the present findings do not establish superiority of one electrotherapy modality over the other.

➤ Funding

No funding was received for this study.

➤ Conflict of Interest

The authors declare no conflict of interest.

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