International Advance Journal of Engineering, Science and Management (IAJESM)
ISSN -2393-8048, January-June 2018, Submitted in May 2018, iajesm2014@gmail.com

# Reduce pain and improve range of motion by Interferential therapy in Adhesive Capsulitis- Pre-post Experimental Trial

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## Abstract

**Background:** Frozen shoulder also formerly termed as adhesive capsulitis that causes tissue degeneration, joint capsule thickening and diminished glenoid cavity with joint restriction and pain. It is one of the most frequently observed shoulder disease in clinical setting. **Patients and Methods:** 30 participants were assessed and treated between the age group of 40-60 years. The subjects were included in the study on the basis of simple random sampling. Outcome measures used were the Visual Analog Scale (VAS) for pain and joint Range of Motion (ROM) was assessed using a universal goniometer. VAS and Joint ROM were assessed pre-treatment and post treatment after the two week of intervention.

**Results:** The results showed that there was significant statistical improvement in VAS and joint ROM of the frozen shoulder when treated with Interferential Therapy. It showed positive results in reducing 30% of pain and increased shoulder ROM with two weeks session of treatment setting.

**Keywords: Interferential therapy, frozen shoulder, Visual Analog scale, range of motion, shoulder Joint**

## Introduction

Adhesive capsulitis is a common musculoskeletal condition that affects the shoulder joint. It is brought on by inflammation and adhesion formation in the synovium and capsule, which results in pain, stiffness, and restricted glenohumeral joint function.[1] There is a general restriction of the gleno humeral joint's passive and active range of motion (ROM), primarily external rotation and shoulder abduction.[2] With an incidence rate of about 2-5% in the general population and 10-20% in the diabetic community, adhesive capsulitis is frequently more common in women, people between the ages of 40 and 65, and in the diabetic population. There is a 5–34% probability that someone with adhesive capsulitis will eventually develop it in the shoulder on the opposite side. It has been discovered that simultaneous bilateral involvement happens in 14% of cases.[3] Trauma, extended immobility, thyroid illness, a history of stroke, myocardial infarctions, and autoimmune disease are additional risk factors.



Neviaser (1983) introduced the concept of adhesive capsulitis when he discovered that the capsule was tight, thickened, and stuck to the humerus in such a manner that it could be peeled off like "adhesive plaster from the skin.[4] According to Loyd and Loyd (1983), secondary frozen shoulder occurs when a painful spasm restricts movement and makes the arm dependent. A common but poorly understood cause of a painful and stiff shoulder is adhesive capsulitis.[5] Although physical therapy and stretching exercises are recommended for treatment in the majority of orthopaedic literature, certain studies have shown late discomfort and functional limitations. These investigations sought to assess the results of individuals with adhesive capsulitis who underwent a stretching-exercise regimen, as described by Griggs et al. (2000). According to Staples et al. (2010), in patients with adhesive capsulitis, the shoulder pain and disability index (SPADI) is more sensitive than the Disability arm, shoulder, hand (DASH).[6]

Transcutaneous electrical stimulation is a common treatment method used by therapists. They can choose between continuous or as a series of pulses direct current administered, or alternating current at various rates.[7] With regard to therapeutic application, each type of current has both benefits and drawbacks. In terms of low-frequency alternating currents and direct current, the outer layers of skin have a high electrical impedance (>1 kHz). Deep tissues are painful to treat because a large transcutaneous current flow is necessary for enough current to go deeply. Even though they usually oscillate too fast to directly trigger the tissues, alternating currents of medium (>lkHz to l0kHz) meet less resistance and easily penetrate the tissues (attributable to a marked decline with how skin capacitance affects current flow). Interferential current therapy, which was developed in the early 1950s, assisted in overcoming these difficulties. The device produces two slightly distinct medium-frequency alternating currents, which are commonly used to induce analgesia, provoke muscle contraction, modify the activity of the autonomic system, enhance healing, and reduce oedema.

A common electrotherapeutic technique for treating pain is interferential treatment (IFT). It is characterised by the interference of two medium-frequency currents (i.e., between 1 and 10 kHz), which combine to create a new medium-frequency current whose amplitude is modulated at low frequency (i.e., between 0.1 and 1 kHz). Interferential therapy is administered transcutaneously using electrode pads in two different ways: quadripolarly (current is delivered via four pads, and interference occurs within the tissues) or bipolarly (current is delivered via two pads, and amplitude modulation occurs within the stimulator).[8]

The precise method by which IFT modulates pain is uncertain, but it has been suggested that it may work by selectively stimulating large- or small-diameter afferent fibres with varying dosages of amplitude modulation frequency (AMF). Activation of the descending pain suppression pathway with endogenous opioid production, physiological obstruction of nerve conduction, enhanced circulation, and placebo mechanisms are some additional proposed causes for IFT analgesia. IFT has thus been broadly categorised as a different type of transcutaneous electrical nerve stimulation (TENS), which is typically regarded as a low-frequency electrical stimulation technique.

The carrier frequency and the AMF are the two fundamental distinctions between IFT and TENS. Theoretically, because of these interferential current properties, skin impedance is reduced and deeper tissue penetration is permitted.[9] The clinical application of various AMF modes, such as constant mode, where AMF stays constant over time, or sweep mode, where AMF changes frequently over time, as well as other IFT application modes, such as bipolar or quadripolar, supported this notion.

The aim of the present study was to study the effectiveness of IFT on functional ability of shoulder in Adhesive Capsulitis.

## Methods

**Study Design:** Pre test post test experimental trial

**Study Setting:** Physiotherapy Clinic OP department, Health Sciences.

**Study Duration:** 2 months

**Sampling method:** Simple random sampling

**Study Sample:** A total number of 30 patients who were diagnosed as adhesive capsulitis by clinical Orthopaedician were selected by random sampling method and divided into 2 groups after due consideration to the inclusion and exclusion criteria.

**Eligibility Criteria**

Inclusion Criteria:

• Patients with 3-4 months duration of adhesive capsulitis.
• Idiopathic adhesive capsulitis (insidious onset).
• Sex-both
• Age group-30 to 50 years.
• Pain with restricted range of motion not more than 50%.
• Unilateral condition.

**Exclusion Criteria**

Polyarthritis.
• Hemiplegic shoulder.
• Cardiovascular disease.
• Osteoporosis.
• Cervical spondylosis.
• Hypertension.
• Subscapularis flexibility deficits.
• Fractured/ Dislocated shoulder

. **Variables:**

Visual analogue scale (VAS)
• Range of motion.

**Materials and Tools:**

Universal Goniometer.
• Couch
• Inch tape
• VAS Scale
• Pillows

**Interventions:**

Conventional exercises • IFT

**Procedure:**

A total number of 30 subjects who met the inclusion criteria were recruited by simple random sampling method by obtaining consent form from the participants. After the informed consent obtained they were provided with the intervention. A pre-post experimental trial was used in this study. The study's objective was presented to the participants in their native language.

**Outcome Measures**

By using a Visual Analogue Scale (VAS) was used to assess pain intensity. Using a scale of 0 to 10, where 10 is the most severe pain, one can report the intensity of their suffering. Measurements of shoulder joint range of motion were made using a universal goniometer. As soon as the first treatment session was over, outcome measures were evaluated from Pre to Post.

**Intervention**

4 electrodes (5.6*80 mm) were used, in one channel, 2 electrodes were placed onto infraspinatus and anterior deltoid muscles, and in the other channel, and 2 electrodes were placed in posterior deltoid and supraspinatus muscles. The electrodes were positioned around the shoulder so that each channel was run perpendicular to the other, and the two current crossed at a midpoint in the center. Setup and interference of currents of these electrodes together constructed a cloverleaf pattern. So, IFC was conducted with following characteristics: isoplanar vector field with carrier frequency of 4 kHz; Beat frequency of 100 Hz,and sweep frequency of 150 Hz, on time/off time schedule of 10s:30s for a 20-min treatment period 10 sessions in the span of 2 weeks.

**Statistical analysis**

Data analysis was done using IBM SPSS statistics (software package used for statistical analysis 2017 version - 26). Descriptive statistics analysis was done to determine the demographic characteristics of the subjects recruited in the study; Student t-test used in the analysis of this study. P–value used in the study to test hypothesis, which help in deciding whether to reject or accept the Null hypothesis. The p–value is probability of obtaining a test value that is at least extreme as the actual calculated value, if the null hypothesis is true.

**Results**

This study results shows that there is statistically significant improvement in the variables of VAS and Shoulder ROM between pre and post mean values after intervention with $p<0.05$. There is homogenous of variables in pre values of variables of VAS and Shoulder ROM in degrees. The Post mean values of VAS and Shoulder ROM in degrees with p values $p<0.05$.

**Table 1: Demographic characteristics of participants**

| Variables | Min | Max | Range | Mean | Standard deviation | Standard error |
|---|---|---|---|---|---|---|
| Age (years) | 40.00 | 66.00 | 26.00 | 52.90 | 7.78 | 2.46 |
| Height | 156.00 | 180.00 | 24.00 | 170.30 | 7.75 | 2.45 |
| Weight (kg) | 55.00 | 65.00 | 10.00 | 59.90 | 2.81 | 0.89 |
| BMI | 18.30 | 23.20 | 4.90 | 20372 | 1.56 | 0.49 |

**Table 2: Normality of all values**

| Variables | Z-value | p-value |
|---|---|---|
| VAS | 0.63 | 0.81 |
| Flexion | 0.57 | 0.89 |
| Abduction | 0.62 | 0.83 |
| Internal Rotation | 0.39 | 0.99 |
| External Rotation | 0.74 | 0.63 |

**Table 3: Comparison of Pre and Post VAS scores**

| Time | Mean | Standard Deviation | Mean Difference | p-value |
|---|---|---|---|---|
| Pre test | 6.04 | 0.85 | 1.86 | 0.005 |
| Post test | 4.18 | 0.95 | | |

**Table 4: Comparison of Pre and Post range of motion scores**

| Variables | Time | Mean | Standard deviation | Mean difference | p-value |
|---|---|---|---|---|---|
| Flexion | Pre test | 119.60 | 14.20 | -30.30 | 0.005 |
| | Post test | 149.90 | 8.36 | | |
| Abduction | Pre test | 87.60 | 12.32 | -16.70 | 0.005 |
| | Post test | 104.30 | 7.36 | | |
| Internal rotation | Pre test | 18.30 | 7.53 | -4.70 | 0.007 |
| | Post test | 23.00 | 8.54 | | |
| External rotation | Pre test | 15.30 | 8.03 | -4.60 | 0.005 |
| | Post test | 19.90 | 8.96 | | |

## Discussion:

The variables of VAS and Shoulder ROM in degrees in experimental group statistically significantly improve as a result of interferential therapy, which occur as a result of the breakdown of adhesions of joint space, flexibility of ligaments, and other joint structures. The range of motion (ROM) of the shoulder joint, particularly the amount of shoulder external rotation, is increased as a result of this physiological adjustment. The VAS was used in this study as a measure of pain reduction to show the therapeutic impact of interferential therapy application.

According to a study by G.C. Goats et al., interferential treatment may effectively activate voluntary muscle, enhance peripheral blood flow, and hasten bone healing. IFT's potential to lessen pain is consistent with this research.[10] Empirical research supports the use of this approach to lessen pain, and this randomised double blinded controlled trial, according to ZAMBITO et al. (2006), provided the first evidence that IFT is significantly helpful in lessening pain. The placebo effect is great at the start of the treatment, but it typically fades within a few weeks.[11]

The considerable improvement in Shoulder Range of Motion (ROM) caused by conventional exercises during a trial with 49 people who had adhesive capsulitis provided evidence in support of the study's findings. Each patient received care for about four to eight weeks. The research attempted to alter the course of the disease and reduce the amount of time required for recovery by combining intense physical therapy with intra-articular infusion and light manipulation. According to the study's findings, nearly 90% of patients had a noticeable improvement after their initial physiotherapy sessions.

## Conclusion

This study concluded that interferential treatment both alleviate discomfort and expand the range of motion in adhesive capsulitis based on its findings. According to the analysis of the data interferential therapy is preferable for reducing pain and enhancing range of motion in adhesive capsulitis.

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