EVALUATE THE EFFECTS OF COMBINATION TREATMENT OF ULTRASOUND AND COLD PACK COMPARED WITH EXERCISE PROTOCOL IN THE TREATMENT OF KNEE OSTEOARTHRITIS

Amool Sakeena Rizvi
Senior Lecturer,
Ziauddin College of Physical Therapy,
Ziauddin University
Email: Sakeenarizvi5@gmail.com

Sumaira Imran Farooqi
Head of Department,
Physical Therapy,
Principal, Ziauddin College of Physical Therapy,
Ziauddin University
Email: principal.zcpt@zu.edu.pk

Dr. Muhammad Sohail Rafi
Asst Professor,
Orthopedic And Spinal Surgeon,
Dr. Ziauddin University, Clifton
Email: sohailrafi@hotmail.com

Irfan Haider Naqvi
Physiotherapist,
Physiotherapy department,
Ziauddin Hospital Clifton
Email: haidersas5@gmail.com

S. Abid Mehdi Kazmi
Associate Professor,
Department of Physiotherapist,
Ziauddin Hospital
Email: syedabidmehdi@gmail.com
Abstract
The purpose of our study was to investigate the effects of ice packs and ultrasound in reducing pain and increase joint ROM in acute knee pain, pain assessed by visual analogue scale (VAS) and range of motion was assessed by the goniometer. There was 80 patients includes male and female with the age of 35-65 years who have been diagnosed with knee osteoarthritis according to American College of Rheumatology were recruited and randomly assigned in two groups. Group A and B, each group comprising of 40 patients. The patients were randomized into the following two treatments with respect to their group assigned, group A was treated with continuous ultrasound (at frequency of 1 MHz with the intensity of 1 w/cm) with the cold pack and on the other side group B was treated with isometric exercises. Both the groups receive a maximum duration of three weeks. Each treatment session was of 30 minutes. The study was conducted in tertiary care hospital of Karachi, Pakistan. Both the groups show significant improvement in all parameters in both following visits (P <0.05). However, there was significant difference between both the groups. Although there was mean reduction in pain intensity. The present study demonstrate that the assessment parameter significantly proved in all the groups but the results suggested group A ultrasound with the cold pack provided more additional benefit in improving pain and functions in addition to exercise training.

Key Words: Osteoarthritis, acute knee pain, ultrasound, exercises, cold pack, VAS, goniometer

Introduction
Arthritis is the inflammation of a joint and may be the oldest known ailment on earth.”Arth” means joint and its means inflammation. The word OA literally means “bone/joint inflammation” although is not a problem medically the right word is arthrosis. Osteoarthritis (OA) is the most common joint disease causing disability in other than 7 million people in the United States.1 Osteoarthritis is defined by American College of Rheumatology “heterogeneous group of conditions that leads to joint symptoms and sign which are associated with defective integrity of articular cartilage, in addition to related changes in the underlying bone at the joint margins”1. Another source of information explains OA as a degenerative joint disease involving the cartilage and many of its surrounding tissues.2 In addition to damage and loss of articular cartilage, there is remodeling of subarticular bone, osteophyte formation, ligamentous laxity, weakening of periarticular muscles and in some cases, synovial inflammation.3 Among musculoskeletal disorder knee osteoarthritis is exceedingly prevailing articular disorder affecting people. It is more common in women than men. As it is irreversible disease its prevalence increases radically with age. In Singapore the Burden of Disease Study 2004 found that the osteoarthritis was the fifth leading cause of disability. Data shows the prevalence of knee osteoarthritis inside the Asia-Pacific region its frequency is 5.8% in rural. India 22-28% in urban and 7.5% in china; and 7% in Australia4. Knee osteoarthritis is most persistent complaints in the population over the age of 15 years which accounts for 41.9% over all prevalence. But in Pakistan data is still undersupplied but some statistics show that knee osteoarthritis is the mainly exclusive disorder in North Pakistan and affects the females in urban affluent community.5,6
The etiology of knee OA is multifactorial and includes both generalized constitutional factors (for example, aging, sex, obesity, heredity, reproductive variables) and local adverse mechanical factors (for example, trauma, occupational and recreational usage, alignment).5,6 Pathologically it’s outlined as condition of articulation characterized by focal loss of gristle with proliferation of recent bone and remolding of joint contour.7

Kellgren and Lawrence also defined a widely utilized grading system for knee OA8.
Grade 1: doubtful narrowing of joint space and possible osteophyte lipping
Grade 2: definite osteophyte, definite narrowing of joint space
Grade 3: moderate multiple osteophytes, definite narrowing of joint space, some sclerosis and possible deformity of bone contour
Grade 4: large osteophyte marked narrowing of joint space, severe sclerosis and definite deformity of bone contour.

The most significant symptom is pain, which can range for mild to debilitating pain arise because of the destruction of cartilage, while in healthy joints it separates and protects bone ends. It is powerfully related to aging. Painful joints restrict and limit the movement, also decrease in joint proprioception. Ultrasound (US) is described as micro-massage. Essentially the same as sound waves but of higher frequency, such waves that are beyond the human audible range. US are used to treat many musculoskeletal diseases and are also reputed to reduce edema, relieve pain increase range of motion and accelerate tissue healing. Ultrasonic energy is described as any vibration at a frequency above the sound range but it is frequency of a few megahertz that are typically used in physiotherapy several frequencies range from 0.5 to 5MHz.

The application of cold to the tissues after injury is a practice as old as medicine itself. Cold therapy or using an Ice pack produces vasoconstriction that slows down the circulation which ultimately results in decreasing inflammation, swelling, muscle spasm and pain. Superficial cold is available in many forms including a verity of commercial cold packs, ice towels and ice cubes. While using a cold therapy, for less than 15 min it shows the effects in reducing pain 70% in acute conditions.

Three major physical impairments, such as knee pain, stiffness, and decreased muscular strength and range of motion are highly related with knee Osteoarthritis and are supposed to contribute to physical disability and progression of the disease. There are three basic therapeutic exercise: isotonic, isokinematic and isometric. Of the all these three, isometric exercise might be the most important and appropriate for the osteoarthritis patient. It is easy to understand by the patients and can be performed at home by the patient easily and comfortably because it requires minimal assistant and demonstration. Further, isometric exercise causes the least pressure, intra-articular inflammation, and bone destruction. The isometric exercise plays the amazing role in the pain management of knee.

METHODOLOGY:
Participants
Patient with knee osteoarthritis were recruited from a territory care hospital Karachi, Pakistan. All the patients were suffering from confirmed diagnosed osteoarthritis of knee joint accordance to the American College of Rheumatology criteria, these patients were evaluated and informed in the initial part of study. Of the 80 patients initially recruited, 77 patients completed all the experimental procedure in the time period of six months (August 2014-January 2015). The study includes male and female, with the age of 35-65 years.

The patients were randomly divided into two groups, group A and B. Both the groups received same treatment protocol except the group A (n=20) receives continuous ultrasound (at frequency of 1MHz with the intensity of 1 w/cm) with the cold pack and the group B (n=20) was treated with isometric exercises of knee. The study was organized in four phases: a physical examination, the pre-assessment of pain and range of motion, the treatment period and post-assessment of pain and range of motion. At the initial phase the all the patients were pre-assessed and examine by the experienced physical therapist to check and confirm the exclusion criteria of our study, in the next phase the treatment secession starts. After the completion of their
sessions all the patients were post-assessed by the same experienced physical therapist. Missed sessions were compensated during the subsequent weeks so that the total number of session was completed.

**Mode of physical therapy treatment**

The patients enrolled in each group participate in their respective intervention meant for 5 weeks (15 sessions). Group A receive the cold pack for at least 10 min and then treated with the continuous ultrasound (at frequency of 1MHz with the intensity of 1 w/cm) and group B receive the isometric exercise of knee passively. The physical therapist was instructed to perform four bouts of 15 sec initially then can raise it up to 30 sec for each limb. Alternative therapy was also introduced to all patients, trancutaneous electrical nerve stimulation TENS for 15 min. after the completion of study the pain and range of motion were assessed. Knee pain was asses by using the VAS, consist of 10cm line on the left side indicating no pain, zero and on the right side indicate the extreme and unbearable pain. Range of motion was assessed in the supine position and side lying position with the goniometer.

**Variables of the study**

In the study following variables are being tested:

i. Knee pain

ii. Range of motion

**Inclusion criteria:**

Patients fulfilling following criteria were included in the study: Patient within age of 35-65 years, patient with pain in knee and Grade 2 and 3 osteoarthritis of knee. Patient satisfying the ACR clinical and radiological classification criteria for knee O.A. Patients reporting mild to moderate knee pain, having crepitus and morning stiffness present.

**Exclusion Criteria:**

Exclusion criteria included Tumor rheumatic disease (with the exception of bilateral knee OA), Bone tissue infection/malignancies, Cardiac Pace Maker, Localized Skin lesion, Patients suffering from neurological and cognitive deficits, Prolonged steroid use, Shots of intrarticular steroid injection <21 days Knee arthroscopy/arthoplasty, Acute Menisci, Ligament and bony injuries, Known Osteoporotic, Anticoagulant therapy, Advance osteoporosis, or history of cardiovascular, pulmonary or endocrinology disease. Over plastic implants. Patients with grade 4 O.A of knee are excluded from this study.

**Ethical Consideration**

**Finding and Analysis**

The finding and analysis is based on the three major parts:

It includes the basic statistical information of the pre and post treatment results of pain

Second part includes the independent t-test which shows the efficacy of treatment amongst the both groups.

Third part of analyses compares on the paired sample t-test to find out the pain results.

Last part of finding and analyses define the gender decimation.
RESULTS:
The first part of the statistical analysis of the 77 patients who continue and participate in the study to find out the effects of ultrasound and ice pack compared with the isometric exercise therapy in the treatment of knee osteoarthritis.

The table 1 defines the pre-treatment score of (n=77) pain VAS

<table>
<thead>
<tr>
<th>Description</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very mild</td>
<td>4</td>
<td>5.2</td>
</tr>
<tr>
<td>Mild</td>
<td>28</td>
<td>36.4</td>
</tr>
<tr>
<td>Moderate</td>
<td>30</td>
<td>39.0</td>
</tr>
<tr>
<td>Sever</td>
<td>15</td>
<td>19.5</td>
</tr>
</tbody>
</table>

The table 2 define the post-treatment score of (n=77) pain VAS

<table>
<thead>
<tr>
<th>Description</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very mild</td>
<td>31</td>
<td>40.3</td>
</tr>
<tr>
<td>Mild</td>
<td>39</td>
<td>50.6</td>
</tr>
<tr>
<td>Moderate</td>
<td>7</td>
<td>9.1</td>
</tr>
</tbody>
</table>

There is a considerable difference found in pre-treatment pain management of knee osteoarthritis
The data is normally distributed (table III) and there are no outliers but the exercise group and the ultrasound and cold pack shows the different statistical values in the treatment of knee osteoarthritis.

<table>
<thead>
<tr>
<th>Group</th>
<th>Week</th>
<th>Mean</th>
<th>SD</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A (ice pack, u/s)</td>
<td>Pre- treatment</td>
<td>6.42</td>
<td>0.770</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>Post- treatment</td>
<td>4.83</td>
<td>0.941</td>
<td></td>
</tr>
<tr>
<td>Group B (exercise)</td>
<td>Pre- treatment</td>
<td>6.44</td>
<td>0.776</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>Post- treatment</td>
<td>4.56</td>
<td>1.074</td>
<td></td>
</tr>
</tbody>
</table>

The independent sample t-test show that the variances of variable are statistically significant (if the significance is less than 0.05 we assumed equal variances amongst the group). The pre and post treatment statistics shows that there is a difference between the effectiveness of both treatments. The significance level of Pre and post-treatment statistics also shows the same result so we reject H0 that is the effect of combination treatment of ultrasound and cold pack compared with exercise the treatment protocol of knee osteoarthritis provides same effects in the management of knee osteoarthritis. At 95% confidence interval we can say that ultrasound and cold pack compared with exercise both have different effects in the management of knee osteoarthritis the descriptive statistics also supported our result that there is a difference between the effectiveness of both the treatments.
DISCUSSION:
Knee osteoarthritis is one of the fourth highest causes of disability in our population. The multiple authors revealed the effectiveness of ultrasound and their results in different ways. But still the effectiveness of ultrasound is controversial in the treatment of knee osteoarthritis, in this study we investigate the effects of ultrasound and cold pack compared with exercise in the treatment of knee osteoarthritis. In physical therapy there is a numerous non-pharmacological ways to treat the knee osteoarthritis. In this study there was an 80 patients who participates in the study, we allocate the all participate in to two groups by using the simple random method. Both the groups A and B treated with the same protocol and time the group A (n=20) treated with continuous ultrasound (at frequency of 1MHz with the intensity of 1 w/cm) with the cold pack and the group B (n=20) was treated with isometric exercises of knee. All the patients were assisted in the initial and last stage of the study to evaluate the variables of the study. Pain was assets by the VAS scale (pre and post assessment).

The descriptive statistics compares pre and post treatment scores which show the significance level of both the treatment is less than 0.05. The first part of the statistical analysis of the 77 patients who continue and participate in the study shows the pre and post score of pain VAS. We also plot the graph and split the gender to find that there was a large number of females participate in the study. We have conducted independent sample t-test in which on bases of pre and post- treatment statistics and its significance level the groups have equal variances. The further analysis is based on this statement and it’s suggested that the ultrasound and cold pack in comparison with exercise therapy both have different effects in the management of osteoarthritis. Other studies show that ultrasound therapy is reported in relieving pain and improving in functions of knee osteoarthritis, there is no evidence that ultrasound therapy and cold pack is unsafe. In three trials no side-effects were reported both in the exercise and treated group.
ACKNOWLEDGE:
I am truly thankful to Almighty Allah for granting me knowledge & awareness to value through learning process. I’m also thankful to supportive staff members of Ziauddin Medical Hospital for providing me relevant information and supporting me throughout the course of my research.

Reference


