

## Comparison Between Intra-Articular Steroid Injection And Ultrasound Therapy in Management of Chronic Knee Osteoarthritis

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### ABSTRACT

**Objective:** To compare the mean pain score and range of motion in chronic knee osteoarthritis patients treated with intra-articular Steroid injection versus ultrasound therapy.

**Study Design:** Quasi-experimental study.

**Place and Duration of Study:** Department of Rehabilitation Medicine, Combined Military Hospital, Pano Aqil Pakistan, from Oct 2020 to Apr 2021.

**Methodology:** Patients were divided into two groups (50 patients in each group). One group received ultrasound therapy for six weeks, with three sessions per week. The second group received a single 80mg intraarticular Triamcinolone Acetonide. Patients in both the groups were monitored for six weeks to assess the pain score and range of motion.

**Results:** A total of one hundred (100) patients with knee pain due to chronic osteoarthritis were included in the study. The mean age in the ultrasound group was  $54 \pm 4.8$  years and in the intra-articular group, the mean age was  $54 \pm 4.7$  years. The mean reduction in pain score and mean improvement in the range of motion were compared between two groups and statistically significant difference was observed ( $p$ -value  $< 0.001$ ).

**Conclusion:** According to our findings, intra-articular Corticosteroid injection is more effective in comparison to ultrasound therapy. However, there were statistically significant reductions in pain scores and improvements in the range of motion in both groups.

**Keywords:** Osteoarthritis, Treatment, Ultrasound, Visual analog scale (VAS).

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### INTRODUCTION

Osteoarthritis (OA) is among the most prevalent recurrent joint disorder, causing significant distress and disability throughout the world.<sup>1</sup> Osteoarthritis is a chronic, progressive, and debilitating disease that affects the entire joint, causing bone and cartilage impairment characterized by the variable inflammatory response, sub-chondral bone structural reforms and articular cartilage breakage.<sup>2</sup>

This chronic joint condition affects more than ten percent of the population, particularly women between 50-60 years of age.<sup>3</sup> It is the leading cause of disability in people over the age of 65, and the incidence of arthritis and chronic joint symptoms rises as people get older.<sup>3,4</sup> Simple home remedies, weight loss, application of local heat and cold packs, pharmacological therapies, physiotherapies, braces to reduce weight on joints, arthroscopies, osteotomies and total knee repla-

cements are used to treat OA.<sup>5</sup>

Ultrasound is a recommended therapy as an excellent pain-relieving tool in such patients. It is non-invasive, simple to repeat and has no negative side effects.<sup>6</sup> Ultrasound therapy has been shown to improve hyaline cartilage repair and soften dense fibrous tissue, resulting in pain-free movement and improved knee OA.<sup>7</sup>

Intra-articular (IA) Corticosteroid injections have been used in clinical practice for pain relief and local inflammation control in OA for decades.<sup>8</sup> Intraarticular Corticosteroid injections can decrease pain and inflammation while also slowing the development of structural reforms.<sup>9</sup> Few studies have evaluated the outcomes of these two therapies. Ayaz *et al*, published a study on the local population complementary therapies for knee osteoarthritis in Pakistan.<sup>10</sup> We, therefore, planned this study to fill the existing gap in the literature for the local population with the rationale to compare the effectiveness of intraarticular steroid injection versus ultrasound therapy in treating chronic osteoarthritis knees.

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**METHODOLOGY**

This quasi-experiment study was conducted at the Department of Rehabilitation Medicine, Combined Military Hospital, Pano Aqil, from October 2020 to April 2021. Prior to conducting the study, an Institutional Review Board approval was obtained (IRB Itr number: 501/ESTB/2021). Using OpenEpi calculator, we calculated the sample size with the prevalence of OA as 6.3%,<sup>11</sup> margin of error of 5% and confidence level of 95%. We included 100 patients using a non-probability consecutive sampling technique.

**Inclusion Criteria:** All the patients of either gender who had symptomatic osteoarthritis for at least 3 years and had Kellgren-Lawrence grading system Grade II or III bilateral knee OA confirmed radiologically on x-ray were included in the study.

**Exclusion Criteria:** Patients with septic arthritis, rheumatoid arthritis, arterial or venous problems, lower limb cellulitis and stroke patients were excluded from the study.

Before the consent, patients were informed about the details of the study. A thorough history and examination were conducted. A visual analogue scale was used to assess pain scores at the start.

Patients were divided into two equal groups (50 each) as group-UT and group-IA. Randomization was achieved with help of balanced permutation blocks by generating random numbers homogeneity between the groups. This was accomplished by using a computer-generated randomization sequence ([http://www. Randomization.com](http://www.Randomization.com)) in blocks.<sup>11</sup> Randomization numbers were written on opaque, sealed envelopes and the sheet detailing the patient's group assignment was kept in a file. The envelopes were opened in sequential order.

Ultrasound therapy was given to group-UT. Patients were scheduled for six weeks of ultrasound therapy, with three sessions per week. One week prior to ultrasound therapy, all the patients were advised to stop taking any knee pain medication. Ultrasound therapy was administered using a multi-frequency US-750 machine with a 1-3 MHZ ultrasound frequency. A ten-minute treatment session with pulsed mode ultrasound therapy was given to all the patients. An ultrasound was used on the medial and lateral sides of the knee joint. Group-IA received a single dose (80mg) intra-articular Corticosteroid injection daily.

Patients in both the groups were given NSAIDs (Aceclofenac 100mg twice daily for ten days and Omeprazole 20mg twice daily for ten days) and were

monitored for six weeks. The pain score was assessed every week using a visual analogue scale (VAS) and range of motion until the sixth week. Age of the patients, body mass index (BMI), disease duration, gender, side of knee involvement, and pain score were all recorded in the structured proforma.

Statistical Package for Social Sciences (SPSS) version 21 was used for the data analysis. Quantitative variables were summarized as mean ± SD and qualitative variables were summarized as frequency and percentages. Chi-square test was applied to find out the association. The pain score and range of motion between the two groups were compared using independent sample t-test. The *p*-value of ≤0.05 was considered statistically significant.

**RESULTS**

In this study, a total of one hundred patients with knee pain due to chronic OA were included. There were 21 (42%) males and 29 (58%) females in ultrasound-group, whereas the intra-articular- group included 23 (56%) males and 27 (54%) females. The mean age of ultrasound-group was 54 ± 4.8 years with the mean BMI of 34 ± 3.5 kg/m<sup>2</sup>. In the intra-articular-group, the mean age was 54 ± 4.7 years with the mean BMI of 35.1 ± 2.8 kg/m<sup>2</sup>. The duration of disease in the ultrasound-group was 4.1 ± 1 years and in the intra-articular-group, it was 4.2 ± 1 years. In the ultrasound-group, bilateral knees were involved in 21 (42%) patients, right knee was involved in 17 (34%) patients and the left knee was involved in 21 (42%) patients. While in the intra-articular-group, bilateral knees were involved in 20 (40%) patients, right knee was involved in 11 (22%) patients and the left knee was involved in 19 (38%) patients, as shown in Table-I.

**Table-I: Baseline characteristics of patients with chronic knee osteoarthritis.**

Characteristics	Ultrasound-Group (n=50)	Intra-articular (IA) corticosteroid injections-Group (n=50)	<i>p</i> -value
Age (years)	54 ± 4.8	54 ± 4.7	0.999
Body Mass Index (kg/cm <sup>2</sup> )	34.3 ± 3.5	35.1 ± 2.8	0.209
Duration of Disease (years)	4.1 ± 0.7	4.2 ± 0.8	0.507
<b>Gender</b>			
Male	21 (42%)	23 (46%)	0.700
Female	29 (58%)	27 (54%)	
<b>Side of Knee Involvement</b>			
Right	12 (24%)	11 (22%)	0.900
Left	17 (34%)	19 (38%)	
Bilateral	21 (42%)	20 (40%)	

The mean pain score between the two groups at baseline showed no statistically significant difference ( $p$ -value=0.83). However, when the same was compared at the sixth week of post-treatment, a statistically significant difference was observed ( $p$ -value=0.001). Similarly, a statistically significant difference was found between the pain score reduction in the US and the intra-articular-groups ( $p$ -value=0.001), as shown in Table-II.

**Table-II: Comparison of mean visual analogue score in the groups.**

Mean Visual Analogue Score (Pain score)	Ultrasound-Group	Intrarticular (IA) corticosteroid injections-Group	$p$ -value
Baseline	6.1 ± 4.8	6.26 ± 1.8	0.830
Post-treatment	2.02 ± 0.6	1.32 ± 0.7	<0.001
Reduction in Pain score	4.08 ± 1.7	4.94 ± 1.8	<0.001

The mean range of motion between two groups at baseline and sixth week of post-treatment were statistically significant difference ( $p$ -value=0.001). In addition, a statistically significant difference was found between the improvement in range of motion in the US and the intra-articular-groups ( $p$ -value = 0.001) shown in Table-III.

**Table-III: Comparison of range of motion in the groups.**

Range of Motion	Ultrasound-Group	Intrarticular (IA) corticosteroid injections-Group	$p$ -value
Baseline	112.3 ± 0.59	111.14 ± 0.33	<0.001
Post-treatment	116.2 ± 0.36	116.4 ± 0.39	<0.001
Improvement in Range of motion	3.9 ± 0.37	5.3 ± 0.35	<0.001

## DISCUSSION

In the Asia-Pacific region, OA of the knee is one of the most common rheumatic disorder.<sup>11</sup> According to a study; knee OA affects 28% of the urban population and 25% of the rural population in Pakistan.<sup>12</sup> Pharmacological and non-pharmacological treatment modalities and a combination of both are used for osteoarthritis. <sup>13</sup> Verma *et al*,<sup>14</sup> conducted a study to compare the efficacy of ultrasound-guided therapy versus intra-articular Steroid injection in the frozen shoulder in terms of pain relief and functional improvement and found that both treatments were equally effective. However, we discovered that intra-articular Steroid injection was more effective than ultrasound therapy in terms of pain score and range of motion, even though both the groups showed significant improvement.

In a similar clinical study, Banshiwal<sup>15</sup> injected a local anesthetic agent to block the supra-scapular nerve and compared its effect with IASI in frozen shoulder. They found the significant improvement in pain and movement restriction at the 4-weeks follow-up.

Intra-articular Corticosteroid injections have been used in clinical practice for decades to relieve pain and control local inflammation in people with osteoarthritis. Intra-articular corticosteroid injections are part of the treatment paradigm for knee OA recommended by the American College of Rheumatology. Intra-articular Corticosteroid injections can reduce pain and inflammation while also slowing the progression of structural changes.<sup>16</sup> In a systematic review, Dawes,<sup>17</sup> found that intra-articular corticosteroid injection reduced osteoarthritic knee pain clinically one week after injection. Gaffney *et al*,<sup>18</sup> found that a single intra-articular injection of Triamcinolone Acetonide provided quick but short-term pain relief in patients with knee OA, with increased benefit related to clinical evidence of joint effusion and successful synovial fluid aspiration at the time of injection. Out treatment effects were consistent with the previous studies by Ravaud *et al*,<sup>19</sup> Jones and Doherty,<sup>20</sup> and Islam *et al*.<sup>21</sup>

In physiotherapy, ultrasound is frequently used to treat painful knee joints. We used ultrasound in pulsed mode because this mode is efficient for both pain and physical activity, whereas continuous mode is only helpful for pain.<sup>22</sup> The pain score and range of motion in the knees improved significantly in our study. Yang *et al*,<sup>23</sup> compared ultrasound therapy with a placebo group and found that ultrasound therapy improved the pain, swelling of the joint and physical activity of the patients. Mumtaz *et al*,<sup>24</sup> conducted a study to determine the role of ultrasound therapy in OA of the knee joint and found an overall improvement in pain.

The use of suitable technique and low number of dropouts were the strengths of our study. In comparison to ultrasound therapy, intra-articular corticosteroid injection is more effective in terms of pain score and range of motion, according to our findings. However, there were statistically significant reduction in pain scores and improvement in range of motion in both groups. More studies preferably, randomized controlled trials should be conducted in order to arrive at a concrete conclusion.

## LIMITATIONS OF STUDY

Patients were only observed for six weeks due to time constraints. As osteoarthritis of knee is a chronic non-resol-

ving condition, monthly and long-term follow up would have generated better results in terms of long-term effectiveness of the two treatment modalities.

### CONCLUSION

According to our findings, intra-articular Corticosteroid injection is more effective in comparison to ultrasound therapy. However, there were statistically significant reductions in pain scores and improvements in the range of motion in both groups.

**Conflict of Interest:** None.

### Authors' Contribution

MR: Conception and design, acquisition and analysis of data, drafting and reviewed the article, WI: Drafted the article and revised it critically for important intellectual content, and approved of the final version to be published, AWB: Drafted the article and revised it critically for important intellectual content, and approved of the final version to be published, OJ: Acquisition and analysis of data and drafted the article, MBN: Acquisition and analysis of data and drafted the article, SAAM: Drafted the article and revised it critically for important intellectual content, analysis of data.

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