

# Comparison of Efficacy of Methylprednisolone and Triamcinolone in Osteoarthritis of the Knee: A Prospective, Randomized, Double-Blind Study

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## Abstract

**Background:** Osteoarthritis is a degenerative joint disease and a common complaint among the elderly patients. Intra-articular steroids have a promising role in not only providing a better analgesia but also delay the surgical intervention in knee arthropathy. We organized a double-blind comparative study to evaluate the efficacy of Methylprednisolone and Triamcinolone for reduction of pain in cases of knee osteoarthritis.

**Materials and Methods:** We enrolled 60 patients from our Department of Orthopaedics and conducted a randomized, double-blind comparative study in patients complaining of knee pain. The patients were divided into two groups: Group I (30 patients) - Inj. Methylprednisolone 80 mg/ml and Group II (30 patients) - Inj. Triamcinolone 40 mg/ml. Our patients were instructed to regularly visit the out-patient department of our institute every 15 days for the next 12 weeks. During 3 months, patients were evaluated (symptoms and physical examination) every 4 weeks and asked to fill up the Visual Analog Scale (VAS), Western Ontario MacMaster (WOMAC), and Knee Society Score (KSS).

**Results:** On observing 100 mm VAS score, while walking 20 m, a statistical difference was found during inter-group comparison of VAS scores after 8-week duration of intra-articular injection ( $P = 0.01$ ). On observing the WOMAC score after 8 weeks of intra-articular injection ( $P = 0.001$ ), a statistically significant difference was observed between Group I ( $96.23 \pm 27.59$ ) and Group II ( $123.31 \pm 25.56$ ). On observing KSS score, 8-week duration; Group I ( $59.25 \pm 8.72$ ) and Group II ( $53.34 \pm 8.90$ ) revealed a statistically significant difference among them ( $P = 0.01$ ).

**Conclusion:** Both intra-articular corticosteroids (Methylprednisolone and Triamcinolone) possess a safer profile, but the use of Methylprednisolone provides more immediate and prolonged improvement in pain, stiffness, and improves joint function.

**Key words:** Intra-articular steroids, Methylprednisolone, Osteoarthritis, Triamcinolone

## INTRODUCTION

Osteoarthritis is a very common orthopedic complaint of elderly and imparts great physical and mental stress to the patient. It is a joint degenerative disorder affecting the joint cartilage leading to joint pain, stiffness, swelling, and disability.<sup>1</sup> It carries a multi-factorial etiology (age, obesity,

trauma, mal-alignment, and genetics).<sup>2</sup> The most common joint affected by osteoarthritis is knee and a recent literature search revealed that more than 10% males and more than 13% females are suffering from this joint degenerative disease.<sup>3</sup>

Various treatment modalities had been proposed over 50 years of knee research. Non-pharmacological techniques comprised of weight loss, patient education, and regular exercise are recommended in treatment guidelines. The combined role of non-pharmacological and pharmacological (aspirin, acetoaminophen, NSAIDS, etc.) techniques has shown to be most convincing.<sup>4-7</sup> However, the pharmacological drugs are having side effects and exposing the major systems of the body to dreadful conditions.

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Intra-articular steroids have been also practiced since a long time, but extensive Medline/Cochrane search revealed a very little convincing result regarding the proper choice of drug. Intra-articular steroids are a good alternative for the patients with Osteoarthritis. These agents have a better and safer profile as compared to oral drugs in terms of adverse effects/contraindications of the later. Moreover, Intra-articular steroids impart a better pain relief by delivering and also delays any surgical intervention thereby improving the patient's quality of life.<sup>8</sup>

Corticosteroids are the most extensive used over the years by many researchers for intra-articular injection. Data regarding the comparison between hyaluronic acid with corticosteroids has revealed that the intra-articular administration of the former drug causes better and long term pain relief in the patients with knee osteoarthritis.<sup>9-16</sup> However, the recent studies and the meta-analysis comparing the efficacy of hyaluronic acid in knee osteoarthritis showed that there was no significant differences observed among the use of intra-articular corticosteroid/hyaluronic acid receiving patients even at 3 or 6 months follow-up.<sup>16</sup>

The above controversial role of corticosteroids advocates more extensive research regarding its use in osteoarthritis. Based on this, we organized a study to compare the efficacy in pain relief of two steroidal agents (Methylprednisolone and Triamcinolone) administered by intra-articular route in patients of knee osteoarthritis.

## MATERIALS AND METHODS

We conducted a randomized, double-blind comparative study in the Department of Orthopedics, TMMCRC, Moradabad, India, during July-December 2014.

The American College of Rheumatology graded Osteoarthritis, knee patients with the age of 30-65 years, having joint pain, pain score of more than 40 mm on 100 mm Visual Analog Scale (VAS), bony crepitus, joint swelling, radiological grading of 3/4 on Kellgren Lawrence Scale and joint damage were included in the study. We excluded the pregnant patients, drug using patients (aspirin, paracetamol, opioids, and non-steroidal anti-inflammatory drugs), patients with secondary osteoarthritis, any chronic renal/liver disease.

We enrolled 60 patients and they were randomized using computer-generated randomization. And they were divided into two groups: Group I (30 patients) - Inj. Methylprednisolone 80 mg/ml and Group II (30 patients) - Inj. Triamcinolone 40 mg/ml.

They were instructed to visit regularly to the out-patient department of our institute every 15 days for the next 12 weeks. In the 3 months period, patients were evaluated (symptoms and physical examination) for every 4 weeks and asked to fill up the VAS Scale, Western Ontario MacMaster (WOMAC) and Knee Society Score (KSS). After completing the questionnaire, the individual scores were added and finally total score was determined. Moreover, we also examined the presence or absence of osteoarthritis problems (joint swelling, crepitation, and tenderness).

## Statistical Analysis

All the parametric data were analyzed using Student's *t*-test and non-parametric data were using Chi-Square/Fisher test whichever is applicable. Data were analyzed using statistical package for social sciences (SPSS) version 19.0. A  $P < 0.05$  was considered as statistically significant.

## RESULTS

We enrolled 60 patients in our study, but 4 of them refused to be a part of the study as they could not turn out for the routine follow-ups. So, the study was conducted on 56 patients (28 patients in each group). The demographic characteristics were observed to be comparable ( $P > 0.05$ ) between the groups (Table 1).

On observing the 100 mm VAS score while walking 20 m, the patients were found to be comparable on baseline parameters in both the groups (Table 2). There was no statistical difference in Group I ( $7.56 \pm 1.09$ ) and Group II ( $7.12 \pm 1.34$ ) on observing the VAS score for 4 weeks after drug administration ( $P = 0.17$ ). However, a statistical difference was found during inter-group comparison of

**Table 1: Demographic characteristics (mean±SD)**

Variables	Group I (n=28)	Group II (n=28)	P value
Age (years)	58.78±7.63	59.92±6.21	0.52
Sex (M:F)	12:18	9:21	0.27
Weight (kg)	66.47±8.35	68.26±7.93	0.39
Height (m)	1.58±0.09	1.60±0.07	0.34

SD: Standard deviation

**Table 2: Baseline assessment scores using VAS, WOMAC and KSS score (mean±SD)**

Variables	Group I (n=28)	Group II (n=28)	P value
100 mm VAS score	8.78±1.31	8.27±0.98	0.09
WOMAC pain score	32.86±7.56	35.57±6.35	0.13
WOMAC stiffness score	10.79±2.42	11.65±3.07	0.24
WOMAC function score	102.46±8.41	105.32±10.52	0.25
WOMAC total score	147.32±17.83	150.69±19.33	0.49
KSS score	37.79±10.62	39.76±8.71	0.43

VAS: Visual Analog Scale, WOMAC: Western Ontario MacMaster, KSS: Knee Society Score, SD: Standard deviation

VAS scores after the 8-week duration of intra-articular injection ( $P = 0.01$ ) (Table 3). Again after 12 weeks, Group I ( $4.47 \pm 1.16$ ) and Group II ( $4.98 \pm 1.23$ ) had comparable results of VAS scores ( $P = 0.11$ ) (Table 3, Graph 1).

WOMAC score comprises of three subgroups: pain, stiffness, and function. The individual subgroup WOMAC score and the total WOMAC score was found to be comparable in the patients received Methylprednisolone or Triamcinolone (Table 2). At 4-weeks of duration after intra-articular Methylprednisolone injection, the patients had the total WOMAC score of  $130.67 \pm 20.95$  while those patients who received Triamcinolone had a WOMAC score of  $139.41 \pm 22.74$  ( $P = 0.12$ ) (Table 4, Graph 2). However, a statistically significant difference was observed between Group I ( $96.23 \pm 27.59$ ) and Group II ( $123.31 \pm 25.56$ ) after 8 weeks of intra-articular injection ( $P = 0.001$ ) (Table 4). On inter-group total WOMAC score analysis after 12 weeks of intra-articular steroids, the results were observed to be comparable ( $P = 0.52$ ) (Table 4).

On observing KSS score, there was no statistical difference between the inter-group baseline/after 4-week parameters (Table 5). However, on observing the KSS score at 8-week duration; Group I ( $59.25 \pm 8.72$ ) and Group II ( $53.34 \pm 8.90$ ) revealed a statistically significant difference among them ( $P = 0.01$ ) (Table 5, Graph 3). Similarly, the statistical significant data were obtained from Group I ( $80.54 \pm 8.27$ ) and Group II ( $57.76 \pm 10.38$ ) after 12 weeks of intra-articular steroid injection ( $P = 0.001$ ) (Table 5).

**Table 3: VAS score after 20 m walk (mean±SD)**

Week	Group I (n=28)	Group II (n=28)	P value
0	8.78±1.31	8.27±0.98	0.09
4	7.56±1.09	7.12±1.34	0.17
8	5.61±1.12	6.30±1.03	0.01*
12	4.47±1.16	4.98±1.23	0.11

\* $P < 0.05$ . VAS: Visual Analog Scale, SD: Standard deviation

**Table 4: Total WOMAC score (mean±SD)**

Week	Group I (n=28)	Group II (n=28)	P value
0	147.32±17.83	150.69±19.33	0.49
4	130.67±20.95	139.41±22.74	0.12
8	96.23±27.59	123.31±25.56	0.001*
12	80.45±23.38	84.19±21.78	0.52

\* $P < 0.05$ . SD: Standard deviation, WOMAC: Western Ontario MacMaster

**Table 5: KSS (mean±SD)**

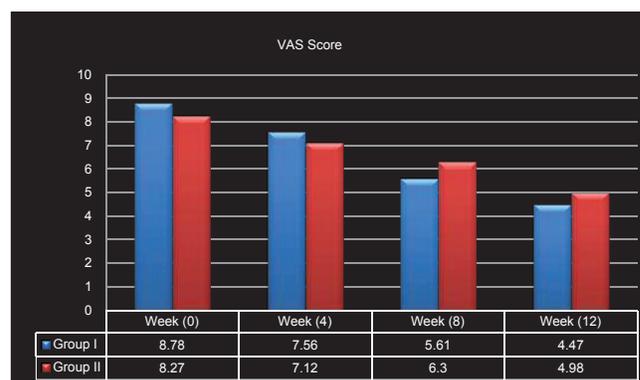
Week	Group I (n=28)	Group II (n=28)	P value
0	37.79±10.62	39.76±8.71	0.43
4	44.47±11.34	45.53±9.86	0.70
8	59.25±8.72	53.34±8.90	0.01*
12	80.54±8.27	57.76±10.38	0.001*

\* $P < 0.05$ . SD: Standard deviation, KSS: Knee Society Score

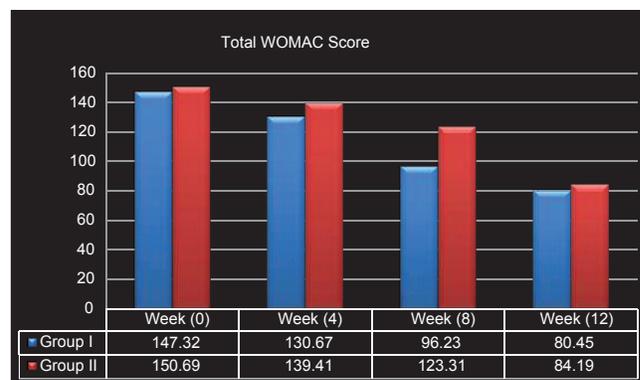
None of the patients reported any adverse events during the study.

## DISCUSSION

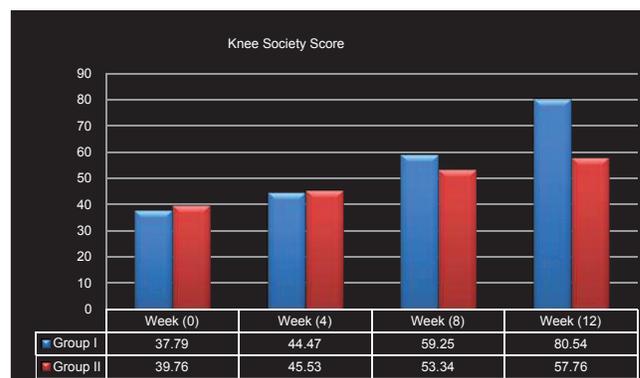
Intra-articular steroids have been extensively used by the doctors for more than five decades. A study conducted by Dieppe *et al.*<sup>17</sup> observed that patients were more satisfied who received corticosteroids as an intra-articular injection in osteoarthritis, compared to placebo receiving group. However, this study was supported by other researchers who similarly observed a short-term beneficial



**Graph 1: Visual Analog Scale score**



**Graph 2: Total Western Ontario MacMaster score**



**Graph 3: Knee Society Score**

effect of corticosteroids in patients with knee and hip osteoarthritis.<sup>18-20</sup> In a study done by Valtonen<sup>21</sup> using multiple injections of Triamcinolone, beneficial effects was observed in knee osteoarthritis patients. Based on these findings, we organized this double-blind study to evaluate the analgesic efficacy of Triamcinolone and Methylprednisolone for knee osteoarthritic patients.

In our study, we observed the VAS score by asking the patients to walk for 20 m. We observed no statistical difference between Methylprednisolone and Triamcinolone receiving patients after 4 weeks of intra-articular injection. However, the significant statistical difference was found during inter-group comparison of VAS scores after the 8-week duration of intra-articular injection ( $P = 0.01$ ). Our findings suggest that both intra-articular steroid injection have beneficial efficacy for analgesia, but Methylprednisolone has been proven have a better analgesic profile in patients with knee osteoarthritis. Our findings are supported by Pyne *et al.*<sup>22</sup> who also compared the analgesic effects of Triamcinolone and Methylprednisolone and concluded that there was no significant difference between the drugs at the 3<sup>rd</sup> and 8<sup>th</sup> week of follow-up. Similar findings were observed by Gaffney *et al.*<sup>23</sup> and Bellamy *et al.*<sup>24</sup> who also demonstrated the significant reduction in pain by intra-articular corticosteroids. A similar study done by Shikhar *et al.*<sup>25</sup> observed a statistically significant effect on VAS scores after 4 weeks on comparing between intra-articular Methylprednisolone and Triamcinolone.

In our study, we observed that the total WOMAC score which is explained under three heads: pain, stiffness, and function. We observed the statistical significant difference between Methylprednisolone and Triamcinolone study groups after 8 weeks of intra-articular injection ( $P = 0.001$ ). Our finding was further supported by Shikhar *et al.*<sup>25</sup> who also observed the statistical significant difference between intra-articular Triamcinolone and Methylprednisolone receiving patients. However, the total WOMAC score at 12 weeks follow-up was comparable between the groups in our study which is contradictory to the study performed by Shikhar *et al.*<sup>25</sup> Smith *et al.*<sup>26</sup> observed an improvement in all the WOMAC subgroup scores in patients given intra-articular Methylprednisolone. Raynauld *et al.*<sup>27</sup> performed a study for evaluating the safety and analgesic efficacy of Triamcinolone in patients suffering from knee osteoarthritis using WOMAC scale. They observed significant improvement in the osteoarthritic knee stiffness and pain in patients given intra-articular steroid. The above findings advocate that intra-articular steroid causes a reduction in knee pain particularly if patients were given Methylprednisolone as this agent proves to provide early onset and prolong the duration of analgesia.

The uniqueness of our study is that we have compared two most used routinely steroidal agents for intra-articular injection. Most of the researchers had compared an intra-articular steroid with a placebo.

Although, lot of patients visit for knee pain in our hospital but despite that we managed only 56 patients for our study. A lot of people refused to be a part of the study because of their busy schedule and appointments. However, we followed a strict protocol for proper inclusion and exclusion of the patients for our study. To decrease the number of drop outs and to improve the compliance we enrolled the candidates who are within a 10 km radius from our hospital, even after all these efforts our four patients did not revert back to the hospital.

During our study course, no adverse events except for local irritation which subsided on its own were observed. The patients responded well with local steroid intra-articular injections.

This study has a limitation that we could have prolonged our study time frame of follow-up to even 6 or 12 months. But due to busy schedule of the patients we could not apply it in our study, otherwise most of the patients would have refused to be a part of the study.

## CONCLUSION

From our study, we conclude that the use of intra-articular corticosteroids (Methylprednisolone and Triamcinolone) possess a safer profile and are also proven to be beneficial in providing short/long-term analgesia from osteoarthritis knee. Moreover, the use of Methylprednisolone provides more immediate and prolonged improvement in pain, stiffness, and improves joint function.

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