

## Original Article

# Therapeutic Effects of Joint Lavage and Steroid Injection in Patients with Primary Osteoarthritis of the Knee

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### Abstract

**Background:** Osteoarthritis (OA) is one of the most common forms of articular disease and one of the major causes of pain and disability especially among the elderly. The purpose of this study was to assess the effect of lavage and intraarticular (IA) injection of corticosteroid in the knee joint for the treatment of OA compared to intraarticular injection of corticosteroid alone.

**Methods:** This prospective clinical trial was done on 39 patients. In the first group (lavage plus intraarticular injection), 19 patients were enrolled and in the second group (intraarticular injection alone), 20 patients included. Initially the patients were classified with respect to their intensity of joint pain using a 100 mm visual analog scale (VAS), their global status (0-100) and Lequesne's functional Index (0-25). These data were obtained at baseline, 4<sup>th</sup> week, 8<sup>th</sup> week and 12<sup>th</sup> week.

**Results:** In the first group, the intensity of pain in 4<sup>th</sup>, 8<sup>th</sup> and 12<sup>th</sup> weeks became significantly attenuated in comparison with baseline value ( $P < 0.001$ ). Although in the second group its intensity in 4<sup>th</sup> week became attenuated compared to baseline value ( $P < 0.001$ ), its intensity did not decrease in 8<sup>th</sup> and 12<sup>th</sup> week significantly. There were significant changes regarding global status and Lequesne's functional index till 12<sup>th</sup> week and in the second group till 4<sup>th</sup> week ( $P < 0.001$ ). Maximum amount of pain attenuation and improvement in global status and Lequesne's functional index in the first group was observed in 12<sup>th</sup> week but responsiveness in the second group decreased significantly after 4<sup>th</sup> week.

**Conclusion:** Joint lavage with or without steroid injection relieves pain and improves function, yet joint lavage and IA injection put a longer effect.

**Keywords:** Knee Osteoarthritis, Joint Lavage, Intraarticular Corticosteroid Injection

Osteoarthritis (OA) of the knee is one of the most common forms of arthritis and a major cause of pain and disability, particularly in the elderly<sup>1</sup>. The aims of treatment in patients with osteoarthritis are to reduce symptoms, minimize functional disability and limit the progression of structural changes in the affected joint. There is evidence that synovial membrane shows inflammatory changes in OA<sup>2,3</sup>. It also appears that synovial inflammation can account for some signs and symptoms of OA, including swelling and joint effusions, stiffness, and possibly pain. There are published studies that strongly suggest an association between joint inflammation and the progression of structural changes in OA<sup>2,4-6</sup>. Corticosteroids are the most

powerful anti-inflammatory drugs used in rheumatology. The benefits and mechanisms of action of intra-articular (IA) corticosteroids in symptomatic OA remain controversial<sup>2,7</sup>. Intraarticular corticosteroid therapy is widely used in the treatment of OA, particularly for the knee. Such therapy is recommended by the American College of Rheumatology (ACR) guidelines for the medical management of knee OA<sup>8</sup>, and its benefit has been evaluated in several controlled studies<sup>9-11</sup>. There are seven controlled trials on intraarticular steroid in OA, involving a total of 311 patients. The data from these studies do suggest a positive benefit, but one that only lasts 1- 3 weeks. Patient with joint effusion and local

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tenderness may enjoy greater benefit. At the basic science level, there are a number of mechanisms by which the improvement is thought to occur: mRNA synthesis, B and T cells function, cytokine levels, metalloproteases and synovial permeability<sup>7</sup>. Some authors concluded that the evidence for the efficacy of IA corticosteroid in the knee OA is relatively weak<sup>7, 12</sup>. The results of several studies have suggested that joint lavage, either blind or with the aid of arthroscopy may be beneficial and can relieve some symptoms such as pain in patients with knee OA<sup>13-14</sup>. Intraarticular lavage in osteoarthritic joints removes the debris, disrupts the adhesions and fibrosis and removes (at least temporarily) the degradative enzymes and chemicals. In a single-blind randomized trial, tidal irrigation of the knee joint significantly decreased stiffness and pain<sup>15</sup>. In one study, joint lavage conferred no more benefit than IA saline injection<sup>16</sup>. Although joint lavage or tidal irrigation have been reported to be beneficial in the management of OA, the results of published studies are conflicting<sup>17, 18</sup>. A sham-controlled, randomized, double-blinded study demonstrated that most, if not all, of the effect of tidal irrigation appears to be attributable to a placebo response<sup>18</sup>. Recent prospective, randomized, double-blinded studies have demonstrated that outcomes after arthroscopic lavage or debridement were no better than placebo procedure for knee OA. These controversies still exist<sup>19-20</sup>. A randomized placebo-controlled trial of arthroscopic lavage versus lavage plus intraarticular corticosteroids in the management of symptomatic OA of the knee has demonstrated that patients improve following joint lavage by arthroscopy, but there were few differences between the IA corticosteroid-treated group and the placebo group<sup>21</sup>.

We hypothesized that joint lavage and IA corticosteroid may have beneficial effects through different mechanisms and that they may act additively or synergistically.

## Materials and methods

After institutional approval and informed patients' consent this prospective clinical trial was done on patients with OA at Al-Zahra hospital, from June to November 2000 (ten months) in Isfahan. In this controlled randomized trial the patient fulfilling the ACR criteria for the diagnosis of knee OA<sup>22</sup> were recruited. Additional inclusion criteria were: pres-

ence of pain scored by the patient at > 40 mm on a 100 mm visual analog scale (VAS) and radiographic evidence of tibiofemoral OA consisting of at least grade II changes according to the Kellgren / Lawrence grading system<sup>23</sup>. Patients were excluded from the study if they had any of the followings:

Serious concomitant medical illness,

Secondary arthritis as defined by the Osteoarthritis Research Society<sup>24</sup>,

Knee surgery scheduled within the following 12 months,

Any IA injection during the past 3 months,

Current treatment with systemic corticosteroids or any slow-acting anti-osteoarthritic drugs (e.g. chondroitin sulfate).

Patients were sequentially randomized (1:1) into one of the therapeutic modalities: joint lavage plus IA corticosteroid (group 1, n=19), IA corticosteroid injection alone (group 2, n=20). The study was open with regard to joint lavage. However, the procedure (joint lavage and IA injection) was performed by a physician other than the evaluator who was unaware of the type of intervention. In patients of group 1, after preparation of the skin with iodine, lidocaine was infiltrated as a local anesthetic. Then arthrocentesis of the knee was performed with 14 gauge cannula using the lateral suprapatellar approach. Then a 10 ml of 2% lidocaine was injected intraarticularly. The medial suprapatellar cannula was connected to an extension line and infusion set containing sterile 0.9% saline. Evacuation was done by the lateral cannula. A total of 1 Liter of 0.9% saline was injected into and evacuated from the knee. At the end of the joint lavage procedure, methyl prednisolon acetate (80 mg) was injected. In patients of group 2, after aspiration, a single IA injection of methyl prednisolon acetate (80 mg) was done.

Clinical assessment was performed before treatment (week 0), and at 4, 8 and 12 weeks after the start of treatment. At each visit, the following parameters were noted:

Evidence of knee effusion,

Severity of pain activity within the previous week evaluated on a 100 mm VAS,

Functional disability estimated by Lequensne's functional index,

Patient assessment of global status, measured on a 100 mm VAS.

The main statistical analyses were performed to assess the effect of joint lavage with IA corticosteroids and IA corticosteroid injection on response rates. Data were analyzed, using paired t-test. A P value < 0.05 was considered as statistically significant. Data were analyzed on a computer using SPSS 9.0 software.

## Results

Of 40 patients enrolled, 1 patient was excluded from the study for inadequate follow up. Baseline characteristics of the OA patients are summarized in table 1. The response to treatment over time evaluated at each visit (weeks 4, 8, 12) for pain, global status and lequesne's function index are shown in table 2. In the first group the intensity of pain, global status and Lequesne's, functional index in 4<sup>th</sup>, 8<sup>th</sup>, 12<sup>th</sup> week significantly attenuated compared to basal value (P<0.001). In the second group the intensity of pain attenuated at 4<sup>th</sup> week compared to the basal value (P<0.001) but its intensity did not decrease at 8<sup>th</sup> and 12<sup>th</sup> weeks. With respect to other variables (Lequesne's functional index and global status), there was no statistically significant effect at weeks 8 and 12.

In the first group the attenuation of pain was 47% at 4<sup>th</sup> week, 43% at 8<sup>th</sup> week and 35% at 12<sup>th</sup> week compared to the basal value and in the second group it was 25% at 4<sup>th</sup> week, 1% at 8<sup>th</sup> week and 2% at 12<sup>th</sup> week compared to the basal value.

## Discussion

Our findings suggest that both joint lavage and IA steroid are beneficial in patients with knee OA. The effect of IA corticosteroids lasted up to 4<sup>th</sup> week. In contrast, with joint lavage, a significant decrease in pain was observed up to week 12. The beneficial effect of IA steroid injection for knee OA has been demonstrated previously, but the duration of its effect is still a matter of debate<sup>10, 11, 25</sup>. In most studies, these benefits have been only short term (1-2 weeks). Our findings confirm the efficacy of IA steroid injection and demonstrate beneficial effects at 4<sup>th</sup> week. Jones and Doherty suggested that variations in the response to IA steroids might be attributable to inaccurate injection. In their study 29% of knee injections were extraarticular<sup>26</sup>. In our study, physicians who performed IA injections were al-

ready well trained and were able to perform other IA procedures such as joint lavage as well.

**Table 1.** Baseline characteristics of the osteoarthritis (OA) patients, by treatments group. Data are mean  $\pm$  SD or n (%)

	Group 1	Group 2	P
Age (year)	64 $\pm$ 5	69 $\pm$ 9	0.05
Sex Male	7 (36.8)	7 (35)	
Female	12 (63.2)	13 (65)	0.90
Body mass index (kg/m <sup>2</sup> )	27.6 $\pm$ 3.7	28.1 $\pm$ 2.9	0.64
Knee effusion	13 (68)	17 (85)	0.20
Bilateral disease	16 (84.2)	15 (75)	0.38
Radiographic localization of OA			
Medial compartment	1 (5.35)	0 (0)	
Lateral compartment	0 (0)	0 (0)	
Patellofemoral compartment	0 (0)	1 (5)	0.24
Medial compartment + Patellofemoral compartment	16 (84.2)	19 (95)	
Kellgren/Lawrence grade			
2	0 (0)	0 (0)	
3	15 (78.9)	18 (90)	0.30
4	4 (21.1)	2 (10)	

**Table 2.** Clinical and functional measures at baseline and at the end of the study (12 weeks) and changes during the study, by treatment group

	Group 1	Group 2
Pain (100 mm VAS)		
Base line	73.42	76.50
4 <sup>th</sup> week	38.68*	57.50*
8 <sup>th</sup> week	41.31*	75.75
12 <sup>th</sup> week	47.89*	78.00
Global status (100-mm VAS)		
Base line	65	71.50
4 <sup>th</sup> week	37.37*	55.75*
8 <sup>th</sup> week	38.68*	70.50
12 <sup>th</sup> week	44.21*	73.25
Lequesne's functional index (0-25)		
Base line	17.31	17.40
4 <sup>th</sup> week	10.53*	14.60*
8 <sup>th</sup> week	11.10*	17.35
12 <sup>th</sup> week	12.37*	17.45

\* P < 0.001 compared to basal values

The beneficial effects of joint lavage have not been demonstrated as clearly as those of IA corticosteroids. Few studies have evaluated the effect of joint lavage performed without arthroscopy. The efficacy of the lavage effect of irrigation was first noted in a study in 1940, in which saline was repeatedly injected and removed. In that study 58 of 64 patients with knee OA had favorable result<sup>27</sup>. Dawes et al<sup>28</sup> were unable to demonstrate significant additional benefit from joint lavage compared with IA saline injection and concluded that joint lavage had no roles in the management of knee OA. However this belief that irrigation in OA knee reduces pain has been given further credence by controlled studies that have compared, as treatment for knee OA, needle irrigation with conservative medical management<sup>15</sup>, needle irrigation with arthroscopic irrigation<sup>13</sup>, and blinded intraarticular corticosteroid injection with placebo injection with or without needle irrigation<sup>17</sup>. These studies have been demonstrated that needle irrigation seems superior to medical management<sup>15</sup>, needle irrigation is comparable with arthroscopic debridement with irrigation, except in patients with meniscal tears<sup>13</sup>, and needle irrigation is as effective as an intraarticular corticosteroid injection but has greater durability of effect, and some additive effects of irrigation and intraarticular corticosteroid injection have been observed<sup>17</sup>. Recently, the first randomized controlled study comparing joint lavage and IA corticosteroids, alone and in combination, in patients with symptomatic OA of the knee joint was published<sup>17</sup>. This study suggested

that both joint lavage and IA steroids were beneficial in patients with knee OA. The effect of IA corticosteroids was maximal at week 1 and lasted up to week 4. In contrast, with joint lavage, a significant decrease in pain was observed up to week 24. An additional benefit was observed by performing a corticosteroid injection after completion of joint lavage, but did not improve functional impairment. Unlike the study of Ravaut et al<sup>17</sup>, our study demonstrated a significant improvement in both functional indices and Lequesne's functional index in the two treatment groups. However, we cannot rule out the possibility that the joint lavage effect may be due only to a powerful placebo effect.

In conclusion, we found that IA injection alone and in combination with joint lavage both, afforded improvement in pain, global status and lequesne's functional index in 4<sup>th</sup> week but this responsiveness was significantly decreased after 4<sup>th</sup> week in the first group although this responsiveness was continued till 12<sup>th</sup> week in the second group.

Therefore joint lavage and IA injection in comparison with IA steroid injection in patients with osteoarthritis of the knee afforded a longer effect over time. Further studies are required in order to confirm these results, and also to identify subgroups of patients who would benefit from such treatments. Also, an adequately designed and powered placebo-controlled trial of knee irrigation seems to be needed.

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