Comparing The Impact of Platelet Rich Plasma Injection Therapy and Acupuncture in The Treatment of Knee Osteoarthritis

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ABSTRACT

The aim of this study is comparing the two methods of injecting platelet-rich plasma (PRP) and acupuncture, this study was carried out to compare the rate of symptom reduction (by valid indices) using two treatment methods in patients with osteoarthritis. The results of this study may help physicians to select the appropriate treatment method considering the conditions of the patients. In this randomized clinical trial (RCT), patients with knee osteoarthritis (OA) (on the basis of American Rheumatology College criteria, clinical and radiographic findings) referred to physical medicine clinic of Bagyatollah Hospital in 2016 were considered as population of study. Sample size was determined to be 30 people for each group. Using table of random numbers and block method (1: 1), patients were divided into two groups: receiving PRP injection and treating through acupuncture. Before and after treatment Patients were visited by a physician who was not aware of treatments groups and in each visit for patients, pain score (based on VAS criterion) and life quality were evaluated through Western Ontario and McMaster Universities Arthritis Index (WOMAC). Obtained data were compared between the two groups. The results showed that both PRP injection and acupuncture methods had significant effect in improving symptoms of pain, range of motion, and quality of life in them. Although the rate of change in the WOMAC index in the acupuncture group was slightly higher than that in PRP group, this difference was not statistically significant. In other words, two methods were almost equally effective in improving the patients' health. According to this result, based on the patient's condition, one of these two methods can be chosen for reducing osteoarthritis symptoms and in terms of the impact no one had preference over the other. Confirmation of these results needs further studies and following the patients up in long-term so that the long-term effect of these treatments on patients are studied, and the recurrence of symptoms are compared in the two groups.

Key Words: Platelet-rich plasma, acupuncture, knee joint osteoarthritis, symptoms, pain, quality of life

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INTRODUCTION

Knee osteoarthritis is among the most common causes of pain in people older than forty years. Knee osteoarthritis is common especially in obese women and the elderly people. In one study, 40% of 40 years old people and 60% of 60 –year- old people have varying degrees of knee osteoarthritis [1]. The main cause of cartilage destruction in arthritis was lack of blood vessels feeding this area [2]. Some factors also facilitate the creation of knee osteoarthritis, including

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obesity, strike, rupture of knee joint elements (such as meniscus, ligaments and joint capsule), diseases causes softening of the cartilage under the patella and its frequent dislocation and knee joint deformities. Lack of control on daily activities that leads to excessive stress in the knee area (cases such as cross-legged sitting, two-leg sitting, prolonged toilet, frequent going up and down the stairs especially if the stairs are steep [3, 4]. One method that has been proposed recently for the treatment of these lesions is PRP (platelet-rich plasma). The pain in many patients are relieved with resting and anti-inflammatory drugs. Sometimes, cortisone injection can help relieve pain, but these drugs have potentially side effects and are not safe. If these types of conservative treatment fail, treatment with PRP may be an effective treatment [5]. Some of the studies have proven the effectiveness of PRP in relieving knee joint pain and inflammation. PRP has a growth factor in the form of protein playing a pirote role in the natural process of healing. Therefore, injecting of condensed growth factors to the damaged tissues may lead to growth of new cells and healing the wounds [6-8]. Experiences have shown that acupuncture has been very excellent in treating and controlling the knee arthritis pain and it can be very helpful treatment method, providing that joint surface has not been destructed so much [9]. Due to reduced pain, analgesic consumption was reduced per se, which could mitigate the negative effects of consumption and also reduce resistance to treatment in cases the patients is reducing his weight. Usually, 8 to 10 sessions per year is enough to minimize or completely vanish the pain. Acupuncture causes weight loss by reducing appetite, increasing sense of satiety, improving intestinal motility and reducing constipation as well as creating peace of mind and improving sleep [10] in patients. Since this disorder causes pain and discomfort and disruption of the activities in affected people, and as there are not many resources available on the impact of PRP in the treatment of this disease, the objective of this study was to compare the effect of PRP and acupuncture in the treatment of knee osteoarthritis in patients referring to physical medicine clinic of Bagyatollah Hospital in 2016.

2- METHODOLOGY

Knee osteoarthritis is the most common type of arthritis. The high prevalence of osteoarthritis, especially in old ages and high level of disability associated with it, suggests that this disease is one of the most important causes of disability in old people. The prevalence of osteoarthritis increases 60 -100% by 2020 [11]. Osteoarthritis is diagnosed based on structural abnormalities or symptoms resulting from this disorder. Many people with evidence of osteoarthritis in radiography have no joint symptoms, but clinically, what is important apart from the health of community, is the prevalence of symptomatic osteoarthritis. Knee symptomatic osteoarthritis means knee pain exists in most of the days in a month, along with osteoarthritis radiographic evidence in knee is seen in almost 12% of people with more than 60 years and 6% of all adults with more than 30 years. The prevalence of hip symptomatic osteoarthritis is seen in one-third of knee osteoarthritis. The osteoarthritis prevalence has strong correlation with patient age and it is more common in women [12, 13]. In this study, we compared the effect of PRP injection therapy and acupuncture in the treatment of knee osteoarthritis in 2016 in patients referred to the physical medicine clinic of Bagyataollah Hospital of Tehran. The method of study is randomized clinical trial. Sampling of the study was according to prevalence of knee osteoarthritis mentioned in the study conducted by Davatchy et al which was 19.3% and by inserting. in the formula, the sample size mentioned in the modern epidemiology book was obtained,there were at least 60 patients to be assessed and compared for the therapeutic effect of acupuncture and PRP in the treatment of knee osteoarthritis (30 patients in each group).

The American College of Rheumatology (ACR) criteria have been used to select patients based on biographies and physical examination and the findings of the radio actor and based on it, they were studied with mild to moderate OA. Written consent was received from patients to enter the plan. Quality of life questionnaire was completed for patients. A questionnaire was prepared for patients, and demographic information such as age, sex, BMI, tests, and other paraclinics was entered into the questionnaire. All data were entered to SPSS 20 software. Quantitative variables were reported as mean (along with standard deviation) and qualitative variables were reported as absolute frequency and percentage of frequency. To compare mean of quantitative variables between the two groups, T test and its non-parametric equivalent were used. Measuring normal and abnormal distribution of quantitative variables was performed by One-Sample K-S test. To compare the frequency distribution of qualitative variables between the two groups, Chi-square test (or Fisher's exact test) was applied. Significance level was considered 0.05. In addition, patients were divided into subgroups, and comparing these subsets was performed using t-test, ANOVA, and their parametric equivalent. Finally, the simulations effect of other variables was assessed by logistic regression test.

3- RESULTS

3-1- Arthritis Index (WOMAC) and its changes

The mean raw score of Arthritis Index (WOMAC) before the intervention was 1558.5 ±721 in PRP group and 1560 ± 7241558.5 in the acupuncture group. This index was increased 851.2 units in PRP group and 935.8 units in acupuncture group after intervention. The mean raw score of arthritis index before and after the intervention and rate of changes showed no significant differences between two groups (P> 0.05 Table 1).

After converting raw scores of WOMAC questionnaire to percentage, this percentage before the intervention was 47.23% in PRP group and 47.27% in acupuncture group, while it was 73.14% in PRP group and 84.75% in acupuncture group after study. After intervention, this amount was increased by 25.91% in PRP group and by 37.48% in acupuncture group. WOMAC index converted to percentage showed no significant difference between the two groups in any of the periods before and after the intervention and rate of changes.

Table 1. Comparison of Arthritis Index (WOMAC) and its changes between the two groups

WOMAC Index	PRP (N=31)	Acupuncture (N=30)	P Value
Before intervention	721.4 ± 1558.5	724.2 ± 1560.8	0.901
After intervention	390.4 ± 2413.7	423.9 ± 2796.7	0.430
Rate of changes	364.8 ± 851.2	321.3 ±935.8	0.352
Trend P Value	< 0.001	< 0.001	-

3-2. Pain score of patients (based on the VAS criterion)

Pain score of patients (VAS) before the intervention was 9.35 in PRP and 8.30 in the acupuncture group. Pain score of patients before intervention in PRP group was significantly more than that in acupuncture group (P = 0.03). Pain of patients after the intervention was reduced by 5.74 units in PRP group and it was reduced by 5.5 units in the acupuncture group. Both groups after the intervention showed significant improvement in pain score (P <0.001). The pain score after the intervention was significantly greater in PRP group compared to acupuncture group (P = 0.04), but the mean of changes in pain of patients were not significantly different between the two groups (P = 0.628 Table 2).

Table 2. Comparison of VAS Score and its changes between the two groups

VAS Score	PRP (N=31)	Acupuncture (N=30)	P Value
Before intervention	1.08 ± 9.35	1.53 ± 8.30	0.003
After intervention	1.67 ± 3.61	1.45 ± 2.80	0.047
Rate of changes	1.59 ± 5.74	2.24 ± 5.50	0.628
Trend P Value	< 0.001	< 0.001	-

3-3. Range of motion (ROM) and its changes

Range of motion (ROM) of the knee in patients before the intervention was 104.8 degrees in PRP group and 108.1 degrees in acupuncture group. The mean of Knee ROM after the intervention was increased by 14.03 in PRP and 13.62 degrees in acupuncture group. ROM in both groups significantly increased after the intervention (P <0.001). The ROM, before and after the intervention and rate of its changes showed no significant difference between the two groups (P> 0.05 Table 3).

Table 3. Comparison of ROM rate and its changes between the two groups

ROM	PRP (N=31)	Acupuncture (N=30)	P Value
Before intervention	6.1 ±104.8	6.3 ±108.1	0.067
After intervention	8.2 ± 118.9	8.8 ± 121.7	0.199
Rate of changes	5.8 ± 14.03	7.1 ±13.62	0.806
Trend P Value	< 0.001	< 0.001	-

3-4- Patients' Quality of life

Quality of life in patients before the intervention was 80.97 in PRP GROUP and 78.80 in the acupuncture group. Quality of life of patients after the intervention was increased by 29.03 units in PRP group and 30.37 units in acupuncture group. Both groups showed significant improvement in the quality of life (P <0.001). Quality of life in patients before and after the intervention and also rate of its changes were not significantly different between the two groups (P> 0.05 Table 4).

Table 4. Comparison of quality of life and its changes between the two groups

Quality of life	PRP (N=31)	Acupuncture (N=30)	P Value
Before intervention	5.9 ± 80.97	6.7 ±78.80	0.188
After intervention	9.5 ± 110.0	8.7 ± 109.17	0.723
Rate of changes	5.7 ± 29.03	4.6 ±30.37	0.324
Trend P Value	< 0.001	< 0.001	-

3-5- The impact of other variables on WOMAC Index changes

3-5-1. Gender of patients

Although female patients had greater improvement in WOMAC index, the improvement rate in the WOMAC index had no statistical significant difference between male and female groups (P> 0.05 Table 5).

Table 5. The effect of gender on WOMAC Index changes

Rate of changes in WOMAC	PRP (N=31)	Acupuncture (N=30)
Male	404 ± 843.7	350 ± 915.6
Female	359 ± 856.5	318 ±943.2
Trend P Value	0.934	0.840

3-5-2- The effect of right and left knee

In the group PRP, rate of improvement in arthritis index was more in the right knee compared to left knee, but in the acupuncture group, the rate of improvement in arthritis index was more in the left knee compared to right knee, but no difference was seen between right and left knees in any of the two groups (P> 0.05 Table 6).

Table 6. Effect of right and left knee on the rate of WOMAC Index changes

Rate of changes in WOMAC	PRP (N=31)	Acupuncture (N=30)
Right knee	345 ± 897.5	371 ± 870.4
Left knee	402 ± 727.7	292 ± 973.7
Trend P Value	0.371	0.406

3-5-3- The effect of patients' age

No significant correlation was observed between age and the changes in WOMAC index in any of groups (Table 7).

Table 7. The effect of age on changes in WOMAC Index

WOMAC Changes	Acupuncture (N=30)	PRP (N=31)	Total (N=61)
Pearson Correlation (R)	0.040	0.284	0.199
P Value	0.837	0.122	0.128

3-6. Comparing WOMAC changes between groups & taking into account the simultaneous impact of other variables

To investigate the simultaneous effect of all variables, two groups were compared by logistic regression and Enter methodically. In this comparison, none of the parameters (except for the right and left knee) showed significant difference between the two groups (P value> 0.05). The regression model is detailed in Table 8.

Table 8. Comparison of the two groups by the regression model, taking into account the simultaneous impact of all variables

Variable	Exp. (B)	P Value
Change in WOMAC	0.999	0.637
Change in VAS Score	0.939	0.665
Change in ROM	0.976	0.579
Change in QOL	1.128	0.412
Age (years)	1.006	0.883
Gender (Male/female)	1.249	0.736
Side (Right/left)	0.314	0.042

DISCUSSION

Results indicated that after the intervention both groups showed significant improvement in arthritis index, pain score, and quality of life. Although the rate of changes in WOMAC index after the intervention in the acupuncture group was slightly more than that in PRP group, the difference between the two groups was not statistically significant. In other words, both groups had a similar effect in improving patients suffering from osteoarthritis. In search of studies conducted up to November 23, 2016, no similar study was not found in comparing the effect of acupuncture treatment and PRP injection. However, the effectiveness of these methods separately or in comparison has been studied in several studies, all of these studies show improved symptom of patients, after PRP injection, and acupuncture. In this regard, a number of studies such as the present study used WOMAC index and VAS criterion for assessing patients, but in other studies, other indices to assess the patients. In terms of the impact of PRP in improving WOMAC index, the present study is in line with the study conducted by Simental-Mendia et al in Mexico in 2016 [14], while in our study; the impact of PRP injections was compared in 33 patients with knee osteoarthritis with prescription of NSAID in 32 patients. In their study, PRP injection method was superior to NSAID. Comparing the score of WOMAC questionnaire of our study and their study at the beginning of this study, it can be concluded that the severity of osteoarthritis in patients of the present study was more compared to the study conducted by Simental-Mendia et al. In their study, WOMAC index was 35.7% in the acetaminophen group and 35.5% in the PRP group, while in our study, it was 55.41% in PRP group, and 55.24% in the acupuncture group. The pain score at baseline suggests this point that in the Simental-Mendia study, it was 5.9 in the acetaminophen group and 4.9 in PRP group. However, in the present study, VAS score was 9.35 in PRP group and 8.30 in acupuncture group. It could be concluded that the impact of PRP injection on WOMAC index can be compared between present study and Simental-Mendia study. This comparison shows that in both studies, PRP injection has roughly the same results, so

that in their study and our study, 24.5% and 25.91% change in WOMAC index was observed after injection of PRP, respectively. However, by comparison of VAS in the two studies, our study had a greater impact on the patient's pain (3 units reduction our study and 5.74 units in our study). In a study by Simental-Mendia et al, knee range of motion and quality of life has not been investigated, that this suggests superiority of this study to their study. [15] met-analysis in Thailand in 2016 compared the effect of PRP injection and hyaluronic acid in reducing symptoms in patients with knee osteoarthritis. This meta-analysis referred to the limited number of clinical trials with good quality, so that only 7 studies investigated the symptoms of patients before and after treatment by WOMAC index in this area. Fewer number of RCT studies indicates lack of enough evidence, so further studies are required for accurate conclusion in this regard. This meta-analysis suggests the superiority of PRP compared to hyaluronic acid in changing the WOMAC index and pain score of patients, which is in line with present study in terms of the effect of PRP injection on the WOMAC index and the pain score of patients. In our study, no significant difference was found in the rate of PRP injection effect and acupuncture on the WOMAC index and the pain score of patients. This research was in line with [16] study in terms of the impact of PRP injection on reducing symptoms of osteoarthritis, while they used different indices to measure the effectiveness of the treatment, so the effectiveness of PRP in this study cannot be compared with their study. They used International Knee Documentation Committee (IKDC) and Knee injury and Osteoarthritis Outcome Score (KOOS). They also did not compare PRP with other method. Pain score of patients (VAS) before treatment was 7.5 in their study, and it was 9.35 in the current study. PRP injection could reduce pain score by 3.7 units in their study and 5.47 units in our study.

In a review study in the January 2016 [17], it was reported that PRP technology is still under development and there is no standard protocol for its development. However, PRP injection is being developed and its common method of injecting into the joint is an effective treatment to reduce symptoms of osteoarthritis, especially in the knee joint. This research is in line with [18] in terms of the effect of PRP injection in the improvement of WOMAC index, while they examined new method of PRP injection and combination of PRP injection and hyaluronic acid in 3 cases (as Case-Series) (PRP injection once and then injection of hyaluronic acid three times and once a week). The change rate in the WOMAC index and VAS in the cases of Chen et al study was more than that of in our study, so that WOMAC index in one of the patients was improved up to 100%. The present study is in line with the study conducted by [19] in terms of injection of PRP in reducing symptoms in patients with knee osteoarthritis, while they compared PRP with hyaluronic acid. As they are used in Knee injury and Osteoarthritis Outcome Score (KOOS) index, the effect of PRP injection cannot be compared with the present study. In the study conducted by Heredia, it has also been noted that in patients with milder osteoarthritis, PRP injection was more effective than hyaluronic acid, but in more severe cases, no significant differences were found between the two groups in terms of change in symptoms. The study conducted by [20], the effect of acupuncture on reducing the symptoms of 30 patients with knee osteoarthritis was investigated. While the study of Chen used in Knee injury and Osteoarthritis Outcome Score (KOOS) index to evaluate the effectiveness of treatment, suggests the effect of acupuncture in reducing symptoms of patients in four indices of pain score, daily living, quality of life, and performance in exercise. They also compared the effect of acupuncture with the control group, whereas in the present study, acupuncture was compared with PRP injection. This study is in line with the study conducted by [21] regarding the effect of acupuncture on the improvement of WOMAC index and the pain score (VAS) in patients with knee osteoarthritis, while they used electro-acupuncture and did not compare Low intensity and High intensity with each other. Additionally, comparing the mean WOMAC before treatment in their study and the present study indicated more severe osteoarthritis in patients of their study in comparison to our study. The rate of change in the WOMAC index was 25.43% in their study, while it was 37.48 in our study. A meta-analysis by [22], as our study, suggests the effect of acupuncture on the improvement of WOMAC index in patients with osteoarthritis. In this paper, a total of 4 studies were reported, three of them were conducted in China and on the other study was conducted in Korea. All studies indicated significant effect of acupuncture in treatment. This article refers to inadequacy of the evidence and the need to conduct more clinical trials with good quality in this area.

CONCLUSION

Results showed that both treatments of injecting PRP and acupuncture have significant effect in improving symptoms (based on the valid WOMAC index), score of pain (based on VAS), range of motion (ROM) and quality of life in patients with osteoarthritis. Although the rate of change in the WOMAC index was slightly more in the acupuncture group compared to PRP group, this difference was not statistically significant. In other words, the two treatments were almost equally effective in improving the patient's condition. According to this result, based on the patient's condition, one of these methods can be selected for reducing osteoarthritis symptoms and none of them has preference to the other in terms of the impact. These results confirm the need for further studies and long-term follow ups so that long-term effect of treatments and possible recurrence of symptoms can be compared in the two groups.

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