



Efficacy of Platelets Rich Plasma in the Management of Osteoarthritis Knee Joint Data from a Tertiary Care Hospital

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ABSTRACT

OBJECTIVE: To evaluate the efficacy of intra-articular injection of platelet-rich plasma in the management of grade 1 & 2 osteoarthritis of knee joints

Methodology: This retrospective study was conducted at Khyber Teaching Hospital Peshawar, Pakistan, using clinical records of patients aged 40 to 70 years diagnosed with grade 1 and 2 knee osteoarthritis. These patients were treated with autologous intra-articular PRP injections between March 2022 and March 2024. The study included 206 patients with only type 1 and 2 osteoarthritis knee joints. No analgesic medications were used after the first month post-injection. VAS and WOMAC scores, before PRP treatment and at 3 months post treatment were compared. Paired t-test and P value were calculated using Microsoft Excel software version 2007.

Results: The study included 206 patients with grade 1 and 2 knee osteoarthritis treated with intra-articular PRP injections. Female patients were 54.36% and male patients were 45.64%. Mean age of the patients was 58.69±9 years. Most of the knees (65%) were having grade II osteoarthritic while 35% knees were having grade I osteoarthritic changes. The pre-PRP injection scores were as follows: VAS score 6.75±0.9, WOMAC pain score 15.97±0.9, WOMAC stiffness score 5.29±1.1 and WOMAC Function score 58.9±6.6. The post-PRP injection scores at 3rd month were: VAS score 2.77±1.19, WOMAC pain score 8.80±1.87, WOMAC stiffness score 2.47±1.17 while WOMAC function score 22.93±5.38. No complications were observed.

Conclusion: Three intra-articular PRP injections administered at one-month interval in patients with grade 1 and 2 osteoarthritis of knee joint resulted in a significant decrease in knee joint pain and improvement in knee joint functions, as assessed by WOMAC criteria. A limitation of our study is the lack of long term follow up, which prevents the evaluation of the sustained efficacy of PRP in osteoarthritis of the knee.

Keyword: Platelets rich plasma, osteoarthritis knees, visual analogue scale, WOMAC

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INTRODUCTION

Knee osteoarthritis (OA) is a degenerative joint condition characterized by pain and stiffness due to cartilage degradation in the knee joint. This disease affects the whole joint, causing gradual cartilage deterioration, synovial inflammation, formation of bony loose bodies, and subchondral sclerosis.¹ Local inflammation, discomfort, stiffness, and restricted joint mobility are some of the clinical features of the disease. Osteoarthritis of the knee joint causes pain and impairment in 10% of the global population. It is a

progressive disease and its symptoms intensify over time.² According to Kellgren-Lawrence Classification System, knee osteoarthritis is graded into five types based on radiological findings on anteroposterior knee radiograph.³ In the United States alone, more than 50 million people suffer from knee osteoarthritis, which costs more than \$100 billion annually in treatment and lost.⁴

Recent management strategies for osteoarthritis knee focus on preventive measures and early treatment. Physical therapy, oral medications, and intra-articular (IA) injections are common

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therapies for osteoarthritis.^{5,6} IA injections, including local anesthetics, hyaluronic acid (HA), and corticosteroids (CCS), are commonly used to treat patients with early-to-mid-stage OA who have not responded well to non-surgical therapies.⁷ However, studies have shown that these treatment provide only transient relief and are often accompanied with adverse effects such as joint stiffness and edema at the injection site.

Platelet-rich plasma (PRP) is a relatively modern therapy that has gained popularity because of its potent regenerative ability, ease of harvesting and preparation, low rejection rate, and minimal side effects.⁸ PRP is obtained from whole blood samples through centrifugation process. It is preferred over other treatments due to its low cost, safety, and long-term benefits.⁹ Platelet α -granules contain several anti-inflammatory and growth factors.^{10,12} It is a biological material having a higher number of platelets than blood plasma. It releases growth factors that stimulate the cartilage cells promoting healing and restoration of damaged areas in the articular cartilage.¹³ Furthermore, it increases local concentration of anti-inflammatory markers such as aggrecan and hyaluronic acid, while inhibiting pro-inflammatory factors like interleukin-1 and cyclooxygenase.¹⁴ After one year, PRP injections were shown to yield better results than hyaluronic acid, placebo, or controls in terms of pain relief and functional outcomes.^{15,17} Additionally, static MRI revealed a statistically significant improvement in articular cartilage healing, regeneration and reduction synovial inflammation in knees treated with intra-articular PRP injections.¹⁸

This study is designed to evaluate the short-term efficacy of intra-articular platelet-rich plasma injection in the management of grade 1 & 2 osteoarthritis of knee joints.

METHODOLOGY

This retrospective study was conducted in Khyber Teaching Hospital Peshawar, Pakistan. Ethical approval of the study was obtained from IREB of Khyber Medical College/ Khyber Teaching Hospital Peshawar (No. 27/DME/KMC, dated April 8, 2024). Clinical records of patients aged 40 to 70 years, of both genders, suffering from knee joint osteoarthritis and treated with autologous intra-articular PRP injections from March 2022 to March 2024 were obtained. The sample size of 206 patients (knees) was calculated based on the efficacy of PRP injection in knee osteoarthritis, estimated to be 38.2%⁸ with margin of error 6.61% and confidence level to 95% using online Raosoft sample size calculator. A simple random sampling technique was used. The record of patients with type 1 or 2 osteoarthritis of the unilateral knee joint, as per Kellgren & Lawrence classification system³ (Table 1) were included in the study. Records of patients with unstable knee, sequel of septic

arthritis knee, rheumatoid arthritis, diabetes, hypercoagulable state, post-traumatic arthritis, pregnant ladies, breastfeeding mothers, thrombocytopenia, hemoglobin level of less than 9 gm, BMI > 30 and prior knee surgery or injections were excluded from the study. All the patients had documented visual analogue score¹⁹, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) questionnaire score²⁰ before PRP injections and after PRP injection at 3rd month. All patients received 3 PRP injections, administered at 1-month interval. No analgesic medications were used after 1st month post intra-articular PRP injection. The Visual Analogue Scale (VAS) ranges were as follow: 0 indicated no pain, 1-3 indicated mild pain, 4-6 indicated moderate pain and 7-0 indicated severe pain. The intra-articular PRP injection treatment was considered effective if the VAS score showed no to mild pain. Any complications recorded were also noted. Analysis of the data was done with the help of Microsoft Excel Software version 2007. Both VAS and WOMAC scores were compared at presentation and 3 months after PRP injection applying Paired t test with p value of ≤ 0.05 as significant. Similarly VAS and WOMAC scores for isolated type 1 and type 2 osteoarthritis were compared at presentation and 3 months after PRP injection.

RESULTS

Clinical records of 206 patients treated with intra-articular PRP injections were studied. There were 112 female patients (54.36%) and 94 male patients (45.64%). Mean age of the patients was 58.69 ± 9 years. Most of the knees (65%, $n=134$) had grade II osteoarthritic while 35% ($n=94$) had grade I osteoarthritic changes (Fig. 1). The pre-PRP injection scores at presentation were as follows; VAS score was 6.75 ± 0.9 , WOMAC pain score was 15.97 ± 0.9 , WOMAC stiffness score was 5.29 ± 1.1 and WOMAC function score was 58.9 ± 6.6 . The post-PRP injection scores at 3rd month were as follows; VAS score was 2.77 ± 1.19 with p value of < 0.00001 , WOMAC pain score was 8.80 ± 1.87 with p value of < 0.00001 , WOMAC stiffness score was 2.47 ± 1.17 with p value of < 0.00001 while

Grade	Radiological findings
0	Normal findings
1	Uncertain reduction in joint space and potential osteophytes lipping
2	Distinct osteophytes and potential reduction in joint space
3	Some sclerosis, obvious restriction of the joint space, moderate numerous osteophytes, and potential deformity of the bone ends
4	Significant sclerosis, a clear deformity of the bone ends, large osteophytes, and a noticeable narrowing of the joint space

Table 1: classification of osteoarthritis knee joint

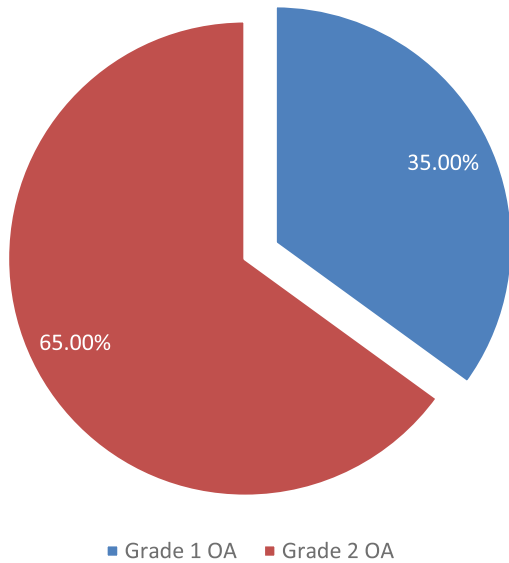


Fig. 1: Distribution of knees according to OA Knee grade

Score	Pre PRP Inj.	Pre PRP Inj. at 3rd month	P value
Visual analogue score	6.75±0.91	2.77±1.19	<.00001
WOMAC pain score	15.97±0.9	8.80±1.87	<.00001
WOMAC Stiffness score	5.29±1.1	2.47±1.17	<.00001
WOMAC Function score	58.9±6.6	22.93±5.38	<.00001

Table 2: Overall efficacy of PRP injections in Osteoarthritis knee

Score	Pre PRP Inj.	Pre PRP Inj. at 3rd month	P value
Visual analogue score	6.64±0.95	2.97±1.18	<.00001
WOMAC pain score	15.92±0.88	9.07±1.8	<.00001
WOMAC Stiffness score	5.17±1.07	2.61±1.24	<.00001
WOMAC Function score	57.97±6.62	23.07±5.13	<.00001

Table 3: Efficacy of PRP injections in type 1 Osteoarthritis knee

Score	Pre PRP Inj.	Pre PRP Inj. at 3rd month	P value
Visual analogue score	6.81±0.89	2.66±1.19	<.00001
WOMAC pain score	15.99±0.9	8.66±1.92	<.00001
WOMAC Stiffness score	5.35±1.13	2.39±1.13	<.00001
WOMAC Function score	59.43±6.55	22.87±5.52	<.00001

Table 4: Efficacy of PRP injections in type 2 Osteoarthritis knee

WOMAC function score was 22.93±5.38 with p value of <0.00001(Table 2).

For isolated type 1 osteoarthritis the pre PRP injection scores at presentation were; VAS score was 6.63±0.95, WOMAC pain score was 15.91±0.88, WOMAC stiffness score was 5.17±1.07 while WOMAC Function score was 57.97±6.62. The post PRP injection scores at 3rd month were; VAS score was 2.97±1.18

with p value of <0.00001, WOMAC pain score was 9.07±1.77 with p value of <0.00001, WOMAC stiffness score was 2.61±1.23 with p value of <0.00001 while WOMAC function score was 23.06±5.13 with p value of <0.00001(Table 3).

For isolated type 2 osteoarthritis the pre PRP injection scores at presentation were; VAS score was 6.81±0.89, WOMAC pain score was 15.99±0.9, WOMAC stiffness score was 5.35±1.12 while WOMAC Function score was 59.43±6.55. The post PRP injection scores at 3rd month were; VAS score was 2.66±1.19 with p value of <0.00001, WOMAC pain score was 8.66±1.92 with p value of <0.00001, WOMAC stiffness score was 2.39±1.13 with p value of <0.00001 while WOMAC function score was 22.87±5.52 with p value of <0.00001(Table 4).

All efficacy parameters showed statistically significant results. No complications were observed in any patient after the injections.

DISCUSSION

Osteoarthritis of knee joint, a degenerative joint condition, is a very common diseases of older age globally. Management should focus on pain relief, functional improvement, and disability reduction.²¹ Our study evaluated the efficacy of intra-articular PRP injections in these patients with either grade 1 and 2 disease in terms of pain relief, improvement in stiffness and functional improvement of the knee joint. We retrospectively evaluated the clinical records of 206 patients (knee joints) using clinical parameters namely VAS score and WOMAC pain, stiffness and functions score of the patients who received 3 platelets rich plasma injections administered at 1 month intervals. The observations obtained during this study showed that intra-articular PRP injections are a valuable conservative treatment for reduction of pain in patients with knee joint osteoarthritis resulting in improving overall daily life activities and quality of life in such patients.

All of the patients in our study were suffering from unilateral knee osteoarthritis. Similarly the female patients out-number the male patients. This indicates that female gender is more prone to osteoarthritis as compared to male. Similar observations can be found in other studies as well.^{21,22}

The overall VAS score in our study improved from 6.75±0.9 pre PRP injection to 2.77±1.19 at 3rd month after 3 injections of PRP with statistically significant p value (<0.00001). Chaudhry et al also observed that VAS score in their study improved from 7.10±1.11 to at 3rd month post PRP injections 4.13±2.11 and then finally to 1.13±2.23 at 1 year after PRP injections.²² The results of our study was statistically significant comparable to the results presented by Chaudhry AA et al. These findings support the efficacy of PRP injections in the management of

knee osteoarthritis.

In our study the WOMAC pain score decreased from 15.97 ± 0.9 to 8.80 ± 1.87 with statistically significant p value. Rai et al²³ managed 98 patients with knee osteoarthritis administering 2 intra-articular PRP injections at 3 weeks interval between the injections. In their study the WOMAC pain score was 15.51 ± 1.45 at presentation which improved to 13.14 at 1 years post PRP injections. These findings support the efficacy of PRP injections in the management of knee osteoarthritis.

WOMAC stiffness score in our study was 5.29 ± 1.1 at presentation which improved to 2.47 ± 1.17 at 3rd month post intra-articular PRP injection with statistically significant p value. In study by Chaudhry AA et al. the WOMAC stiffness score at presentation was 6.43 ± 2.23 which improved to 3.31 ± 2.45 at 3rd month and 2.13 ± 4 at 1 year after injection. Our results are comparable to their study.²²

The WOMAC function score in our study was 58.9 ± 6.6 at presentation which improved to 22.93 ± 5.38 at 3rd month post intra-articular PRP injection. Rai et al²³ presented in their results while treating 98 patients of osteoarthritis knee joints with two PRP injections 3 weeks apart that the WOMAC function score improved 57.96 at presentation to 54.57 after 1 year on PRP injections. Kavadar et al²⁴ divided 120 patients suffering from knee osteoarthritis into 3 groups A, B & C, receiving a single intra-articular PRP injection, two intra-articular PRP injections and three intra-articular PRP injections respectively. All the patients were evaluated at 1st month, 3rd months, and 6th months post injection through VAS and WOMAC questionnaires. All the patients significantly improved on both the scores especially those patients who received two PRP injections. So they advocated at least two PRP injections for osteoarthritis knee joints. Guilibert et al²⁵ studied 57 patients with osteoarthritis of knee joints, receiving a single PRP injection and saw considerable improvement in knee pain score (from 37.5 ± 25.1 to 12.9 ± 20.9) and in Knee Injury and Osteoarthritis Score (from 43.5 ± 14.3 to 66.4 ± 21.7) at 6th month after PRP injection. Cole et al²⁶ divided 99 patients suffering from knee joints osteoarthritis into 2 groups, 49 of them received PRP injections and 50 received hyaluronic acid injections. No significant difference between the two groups were noted on WOMAC scores while VAS was significantly improved in the PRP. They ascribed PRP's therapeutic benefits to a considerable drop in TNF- α levels and Interleukin-1b in the knee joints synovial fluid of patients treated with PRP when tested at 12 weeks of injections.

Regarding isolated types of osteoarthritis, intra-articular PRP injections in knee joint showed improved efficacy in both type 1 and type 2 osteoarthritis of knee joint on both VAS and WOMAC scores with statistically significant results.

A meta-analysis by Migliorini et al²⁷ comprised of 30 randomized

studies including 3463 individuals, comparing PRP injection to steroids, hyaluronic acid, and placebo. PRP had improved WOMAC scores than placebo, HA, and steroids at 12th month. PRP had a considerably lower VAS score than steroid, placebo, and HA. Shen²⁸ also conducted a meta-analysis comprised of 14 randomized studies including 1423 individuals, comparing PRP injection to injections of either steroid, Ozone, hyaluronic acid or saline. After 12 month follow up, PRP injection had considerably improved WOMAC scores than all of them.

In contrast to the previous research, Halpren et al²⁹ studied 22 patients suffering from early osteoarthritis knee treated with PRP injections. After 12 months of follow-up, there was an improvement in pain score while the WOMAC score rose. In 73% of these patients, an MRI revealed no significant changes in intra-joint structure. Patel et al³⁰ also reported considerable decrease in WOMAC scores early after PRP injections intra-articularly and it remained the same even at follow up after 6 months, with a little deterioration in WOMAC values. Bottegoni et al³¹ also noticed an improvement in VAS, IKDC, and KOOS in the early phase of treatment with PRP injection followed by a considerable decline 6 months later. Because there is no standardized approach for PRP in the literature, probable causes for these variances in result include differences in PRP extraction technique, preservation of PRP, duration and frequency of PRP injections.²³

We observed no complications in our study. Rai et al²³ found dizziness, headache, sweating, and syncope 9.18% of their study individuals after intra-articular PRP injection. According to Patel et al³⁰ these negative aspects of PRP are due to increased platelets concentration and CaCl₂. Many researchers have studied the efficacy of intra-articular steroid injections & intra-articular hyaluronic acid injections in the management of osteoarthritis knee but all of them are of the view that these drugs provide pain relief for a very short period of time. Besides this, these drugs are also having serious adverse effects on human body as well. Moreover, both hyaluronic acid & steroids have no regenerative effect on both articular cartilage and meniscus of the knee joint. On the other hand intra-articular platelets rich plasma injections provide pain relief by releasing growth factors and thus helping in stimulating cell proliferation, formation of collagen, and helping in healing of both cartilage & meniscal tissues. Similarly Platelet rich plasma is native to human body.³²

CONCLUSION

Three intra-articular PRP injections at 1 month interval in grade 1 and 2 osteoarthritis of knee joint resulted in a substantial decrease in knee joint pain, improvement in knee joint functions according to WOMAC criteria. Long term follow up in our study

is missing to evaluate long term efficacy of platelets-rich plasma in osteoarthritis knee which is a limitation of our study.

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CONFLICT OF INTEREST

Author declared no conflict of interest

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AUTHORS CONTRIBUTIONS

FK: Conception, Design of the work, Data collection, and Drafting, Reviewed, Final approval, Agreement to be accountable.

SA: Conception, Design of the work, Acquisition, Data Analysis, and Drafting, Reviewed, Final approval, Agreement to be accountable.

MT: Conception, Design of the work, Interpretation of data for the work, and Drafting, Reviewed, Final approval, Agreement to be accountable.

AH: Conception, Design of the work, Data collection, and Drafting, Reviewed, Final approval, Agreement to be accountable .

DATA SHARING POLICY

The data that support the findings of this study are available from the corresponding author upon reasonable request.



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