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Retrospective observational study of role of platelet rich plasma in osteoarthrosis of knee joint among Indian population

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ABSTRACT

Background: Direct release of platelet-derived factors at the site of cartilage disease, especially knee osteoarthrosis (OA), may promote tissue repair by further mediating the anti-inflammatory response and stimulating the natural regeneration signalling cascade. The study's objective was to assess how well platelet rich plasma (PRP) injections worked to improve joint function and lessen pain in Indian patients with osteoarthrosis of the knee.
Methods: The study was a retrospective, observational. It was a multi-centric study. The retrieved study data covered one year. Data of 150 participants were retrieved for the study. The study comprised patients between the ages of 40 and 75 who had knee osteoarthrosis (Kellgren–Lawrence grade I–III) that was confirmed by radiography and clinical examination. Only individuals who had received intra-articular PRP injections with at least six months of follow-up data, experienced chronic knee pain that lasted longer than three months, and were not responding to conservative treatment were eligible.
Results: The mean WOMAC score for patients with grade I–II OA (n=93) increased by 49.3%, from 66.1±7.3 at baseline to 33.5±5.4 after six months. On the other hand, the WOMAC score increased by 31.8% in grade III OA patients (n=57), from 72.1±6.8 to 49.1±5.7. In terms of pain and function, 65 patients (43.3%) reported good improvement and 58 patients (38.7%) reported outstanding improvement.
Conclusion: In patients with knee osteoarthrosis, especially in the early and intermediate phases of the condition, PRP therapy greatly reduced discomfort and improved functional outcomes.

Keywords: Knee, Knee joint osteoarthrosis, Platelet-rich plasma, Osteoarthrosis

INTRODUCTION

In adults, osteoarthrosis (OA) is the most prevalent kind of knee arthritis.[1] Joint structural and functional failure is the clinical and pathological consequence of a variety of illnesses. It is a long-term condition that affects every part of the joint, including the synovium, menisci, ligaments, subchondral bone, and periarticular muscles.[2]

In later stages, osteoarthrosis can cause severe morbidity due to its sluggish progression. Early on in the illness, the patient needs ongoing pain management in order to continue with their daily activities. Non-steroidal anti-inflammatory medications, physical therapy, stretching exercises, corticosteroid injections, and extracorporeal shockwave therapy are examples of conservative treatment modalities that are thought to be the cornerstone of care for significant pain relief in the early stages of this illness.[3]

Megakaryocytes in the bone marrow create tiny cytoplasmic fragments known as platelets, also termed thrombocytes. Platelet activation, which occurs following spontaneous injury to a blood artery wall, is closely linked to most platelet functions. When different tissue proteins

come into contact with platelets, they activate them and release the contents of their granules from the cytoplasm.[4] other chemicals, such as growth hormones, cytokines, and other soluble proteins, are present in these platelets.[5]

In addition to clotting, platelets are involved in a number of physiologic signaling systems and are associated with a wide range of illnesses. Consequently, these cells also contribute to immunological response, vasoconstriction, inflammation, and tissue regeneration.[4] Platelet-rich plasma (PRP) is made by centrifuging blood and is an autologous supra-physiologic concentration of platelets in a tiny amount of plasma. Cytokines and growth factors that can promote cellular growth, vascularization, proliferation, tissue regeneration, and collagen synthesis are present in PRP at concentrations that are three to five times greater than platelets and one to twenty-five times higher.[6]

Direct release of platelet-derived factors at the site of cartilage disease, especially knee OA, may promote tissue repair by further mediating the anti-inflammatory response and stimulating the natural regeneration signaling cascade.[7]

PRP has been demonstrated to be at least as effective as intra-articular hyaluronic acid and steroid injections for symptom control in cases of early OA of the knee.[8] This treatment could improve tissue regeneration because it is a less invasive procedure. About 70% of the growth factors in PRP's alpha granules will be secreted within the first ten minutes, and nearly all of the stored amount will be released within the first hour.[9]

The study's objective was to assess how well PRP injections worked to improve joint function and lessen pain in Indian patients with osteoarthrosis of the knee.

METHODS

Study design

The study was a retrospective and observational.

Study settings

It was a multi-centric study. The retrieved study data covered one year.

Study population

Data of 150 participants were retrieved for the study. The study comprised patients between the ages of 40 and 75 who had knee osteoarthrosis (Kellgren–Lawrence grade I–III) that was confirmed by radiography and clinical examination. Only individuals who had received intra-articular PRP injections with at least six months of follow-up data, experienced chronic knee pain that lasted longer than three months, and were not responding to conservative treatment were eligible. Patients with uncontrolled diabetes, immunocompromised conditions, bleeding or coagulation disorders, inflammatory joint illnesses, or severe OA (grade IV) were not included. The study also eliminated participants with incomplete medical records, recent knee injuries or surgery, or past intra-articular injections within six months.

Data collection

Medical records of patients who received PRP injections for knee osteoarthrosis over a one-year period were used to gather patient data retrospectively. Age, gender, radiological grade, laterality, and baseline VAS and WOMAC scores were among the data gathered. After therapy, follow-up records at one, three, and six months were examined to evaluate changes in pain, function, and any side effects.

Study procedure

Autologous venous blood obtained under aseptic circumstances was used to make PRP. To separate platelet-rich plasma from red blood cells and platelet-poor plasma, the blood was centrifuged. Following aseptic procedures, the extracted PRP was injected intra-articularly into the afflicted knee joint. Following the treatment, patients were instructed to refrain from physically demanding activities for 48 hours and to resume their regular physical therapy. At one, three, and six months, follow-up assessments were carried out to monitor any negative effects and evaluate pain and functional outcomes using VAS and WOMAC scores.

Statistical analysis

The statistical analysis was conducted using statistical package for the social sciences (SPSS) version 26.0. Microsoft Excel was used to originally enter the data. The information has been displayed as mean±SD or as the number of participants (n) with percentages (%).

For statistical analysis, the independent t-test was employed. A p value of less than 0.05 was considered to be statistically significant.

RESULTS

The participants ranged in age from 40 to 75, with a mean age of 56.3±8.4 years. There were 92 (61.3%) ladies and 58 (38.7%) males among them. In terms of laterality, 48 patients (32%) had unilateral osteoarthritis, while 102 patients (68%) had bilateral involvement. 24 patients (16%) had grade I, 69 (46%) had grade II, and 57 (38%) had grade III disease according to the Kellgren–Lawrence radiological grading. The baseline characteristics of study participants are detailed in Table 1.

Figure 1 shows the age distribution of research participants. The age group of 50–59 years old had the highest number of participants (56, or 37.3%), followed by

the group of 60–69 years old (45, or 30%). 28 individuals (18.7%) were between the ages of 40 and 49, while 21 participants (14%) were beyond the age of 70.

Table 1: Baseline characteristics of study participants.

Parameters	Value (%)
Age (in years)	56.3±8.4
Male participants	58 (38.7)
Female participants	92 (61.3)
Laterality of knee OA	
Unilateral	48 (32)
Bilateral	102 (68)
Kellgren–Lawrence grade	
Grade I	24 (16)
Grade II	69 (46)
Grade III	57 (38)
Baseline VAS pain score	7.8±1.1
Baseline WOMAC score	68.5±7.6

At 1 month, 5.6±1.0, 4.1±0.9, and 3.4±0.8, the mean baseline VAS score dropped from 7.8±1.1. In a similar vein, the average WOMAC score dropped from 68.5±7.6 at baseline to 54.2±6.8 at one month, 42.7±6.3 at three months, and 35.5±5.9 at six months. The VAS and WOMAC score changes following PRP injection are shown in Table 2.

The mean WOMAC score for patients with grade I–II OA (n=93) increased by 49.3%, from 66.1±7.3 at baseline to 33.5±5.4 after six months. On the other hand, the WOMAC score increased by 31.8% in grade III OA patients (n=57), from 72.1±6.8 to 49.1±5.7. The improvement in WOMAC score by osteoarthritis severity is displayed in Table 3.

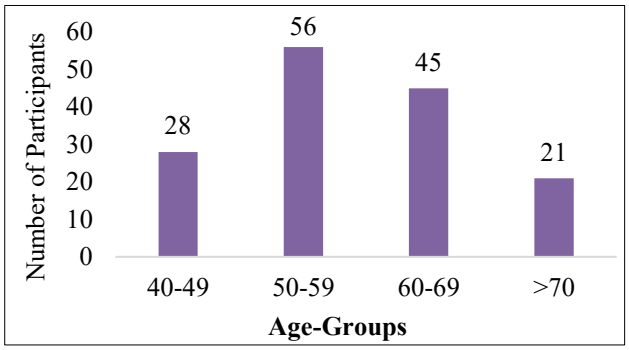

Figure 1: Distribution of age-groups among study participants.

Table 2: Change in VAS and WOMAC scores after PRP injection.

Follow-up interval	VAS score (mean±SD)	WOMAC score (mean±SD)	P value
Baseline	7.8±1.1	68.5±7.6	-
1 month	5.6±1.0	54.2±6.8	<0.001
3 months	4.1±0.9	42.7±6.3	<0.001
6 months	3.4±0.8	35.5±5.9	<0.001

Table 3: Improvement in WOMAC score by severity of osteoarthritis.

Kellgren–Lawrence grade	Baseline WOMAC (mean±SD)	6-Month WOMAC (mean±SD)	% Improvement	P value
Grade I–II (n=93)	66.1±7.3	33.5±5.4	49.3	<0.001
Grade III (n=57)	72.1±6.8	49.1±5.7	31.8	<0.001

Of the 150 individuals who had PRP injections, 14 (9.3%) experienced moderate local pain or swelling, and 5 (3.3%) experienced temporary stiffness. The side effects of PRP injection are shown in Table 4.

Table 4: Adverse effects observed after PRP injection.

Adverse effect	No. of cases (n=150)	Percentage (%)
Mild local pain/swelling	14	9.3
Transient stiffness	5	3.3
Infection	0	0
Effusion	0	0

In terms of pain and function, 65 patients (43.3%) reported good improvement and 58 patients (38.7%) reported outstanding improvement. Eight patients (5.3%) showed no discernible improvement, whereas 19 patients (12.7%) showed fair improvement. Overall results at six months are displayed in Figure 2.

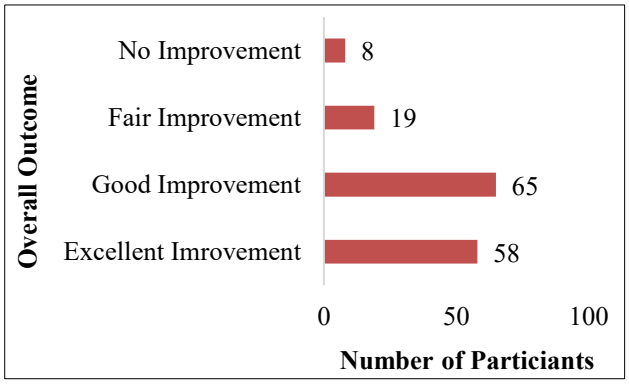

Figure 2: Overall outcome at 6 months.

DISCUSSION

The effectiveness of PRP injections in patients with knee OA was assessed in the current multicentric retrospective analysis, which showed a substantial improvement in VAS and WOMAC ratings at 1, 3, and 6 months following

therapy. The WOMAC score dropped from 68.5±7.[6] to 35.5±5.[9] ($p<0.001$), while the mean VAS score dropped from 7.8±1.1 at baseline to 3.4±0.8 at six months. These findings unequivocally show that PRP therapy successfully reduces pain and gradually enhances knee joint function.

The results are consistent with earlier research showing PRP's therapeutic advantages in knee OA. Intra-articular PRP injections significantly improved VAS and WOMAC scores, especially in early-stage OA as opposed to advanced phases, according to Spaková et al.[9] At a 6-month follow-up, Raeissadat et al discovered that PRP was more effective than hyaluronic acid in lowering pain and enhancing function.[10]

Similarly, up to a year after PRP treatment, Filardo et al reported increased quality of life and long-lasting pain alleviation.[11]

Patients with Kellgren-Lawrence grade I–II OA improved more in the current trial (49.3% reduction in WOMAC scores) than those with grade III (31.8% reduction), indicating that PRP is more beneficial in the early and moderate phases of the condition. This finding lends credence to the theory that PRP functions through biologic regulation and cartilage repair—mechanisms that might be restricted in advanced OA with significant cartilage loss. Platelet-derived growth factor (PDGF), transforming growth factor-β (TGF-β), and vascular endothelial growth factor (VEGF) are growth factors that stimulate chondrocyte proliferation, extracellular matrix synthesis, and anti-inflammatory pathways, according to Sampson et al.[12,13]

Only 9.3% of patients reported modest local pain or swelling and 3.3% reported temporary stiffness; no infections or effusions were noted, indicating that the therapy was well tolerated. These results align with the excellent safety profile of PRP described by Kon et al and Patel et al, who found no serious problems and only minor, self-limiting adverse effects.[14,15]

Limitations

It might not be possible to generalize the results of this study to a larger population because it was carried out in a multicentric facility. Furthermore, the study's sample size was insufficient for extrapolating results and drawing inferences.

CONCLUSION

In patients with knee osteoarthrosis, especially in the early and intermediate phases of the condition, PRP therapy greatly reduced discomfort and improved functional outcomes. According to the findings, intra-articular PRP injections may be a safe, efficient, and regenerative therapy option that can postpone the need for surgical procedures like total knee replacement.

Recommendations

For those with early to intermediate knee osteoarthrosis, PRP injections may be suggested as an additional treatment. To verify the long-term effectiveness and create standardized PRP preparation and administration procedures, more research with bigger sample sizes, prospective randomized designs, and longer follow-up periods is necessary.

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