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A study of the role of platelet rich plasma in the treatment of knee osteoarthrosis

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Abstract
Background*: The posterior approach is the most commonly used approach for mid-shaft and distal humeral fractures. However, fixation via the posterior approach is associated with iatrogenic radial nerve palsy. The purpose of this study was to evaluate the functional outcomes of shaft humerus fracture plating with anterolateral approach.*
Material and Methods*: The present prospective study was conducted in the Department of Orthopaedics, ASRAM ELURU and included 100 cases aged between 35-70 years, who were operated for shaft humerus fractures over last 3 years with plating by anterolateral approach.*
Results: *The mean age is 49.92 in group A and 54.16 in Group B, statistically significant decrease in the WOMAC score over the course of the study at 6 weeks and 3 months. WOMAC score of 33.40 for group A and 66.44 for group B at 6 months .*
Conclusion: *We conclude that decrease in the WOMAC score in patients receiving intra articular PRP injections was statistically significant when compared to patients who received Normal saline injections. Thus injectable Platelet Rich Plasma may be considered a safe, effective addition to the present armamentarium for treating Osteoarthritis of knee.*
Keywords: *osteoarthritis of knee ,platelet rich plasma.*

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I. Introduction

Osteoarthritis of knee is one of the most common musculoskeletal disabilities, accounting for approximately one-third of all cases[1]. When it comes to debilitating diseases, osteoarthritis is one of the most common. It is associated with a significant social and financial burden, in addition to the psychological & physical sequelae that it frequently manifests in the patient[2]. When it comes to YLD, osteoarthritis ranks fourth, accounting for a third of the total global YLD's (years lived with disability). According to the World Health Organization, the demand for total knee arthroplasties will increase by 67 percent by 2030. Currently, this condition places a tremendous strain on the United States economy, resulting in billions of dollars in annual expenditures associated with treatment needed for pain control, rehabilitation, as well as joint replacements.[3]

Osteoarthritis is a clinically heterogeneous condition, and the processes that lead to the destruction are still poorly understood. [1] Today's consensus is that the imbalance between proinflammatory cytokines (such as interleukin [IL]-1a, interleukin 1 (IL-1), and tumour necrosis factor-1) and anti-inflammatories, which contributes to disease progression, is responsible for the progression of the disease (including IL-1ra, IL-4 & IL-10). It is believed that this cytokine imbalance causes proteolytic enzymes to be activated, results in cartilage destruction.

Recent new treatment options for osteoarthritis have theirorigins in an attempt to correct this cytokine imbalance, which is a fundamental component of the disease. Furthermore, arthritis of the knee joint has been shown to negatively affect the subchondral bone, the synovium, the ligaments and capsules of the knee joint, as well as the surrounding musculature, and it may even affect the sensory nervous system. [3]

Patients with mild to moderate arthritis have few treatment options available at this time. The majority of the approaches are palliative in nature and focus on alleviating symptom rather than altering the biochemical environment of the joint or slowing the progression of the disease . Obesity reduction and exercise are excellent treatment options forosteoarthritis, but they are frequently associated with low compliance.

A growing number of alternative management options, such as biological and regenerative methods, are becoming more popular as a result of the limitations in the effectiveness of conventional management options Current research efforts are centred on the identification of key biochemical pathways that can be targeted therapeutically through biological intervention, as well as the testing of protein bio therapeutics for restoring the metabolic balance within the joint, both of which are currently underway. Recent advances in tissue biology, in particular, have highlighted the potential for the use of specific growth factors as therapeutic proteins for cartilage repair, which is now being investigated extensively both in vitro and in vivo.

In addition to platelet-rich plasma (PRP) injection graft therapy, high concentration platelet-rich plasma (HCPRP), autologous bone marrow aspirate concentration and adipose cells, nerve growth factor inhibitor, interleukin-1 receptor antagonist, osteogenic protein-1are some of the experimental ortho biological treatments being investigated [4].

Using autologous platelet-rich plasma (PRP), which contains a pool of growth factors, it appears to be possible to deliver multiple growth factors required for tissue repair in a straight forward manner. Autologous platelet-rich plasma (PRP) is a volume of plasma with a platelet concentration greater than the normative baseline values . It has been shown that platelets contain high concentrations of cytokines, which have been shown to regulate a variety of processes related to wound healing and tissue regeneration.[5-7] PRP therapy is a technique that delivers a highly concentrated cocktail of growth factors to the body in order to accelerate healing.

Current research on PRP therapy is anecdotal, nonrandomized, or involves insufficient sample sizes and is underpowered [8], according to the American Society of Clinical Oncology. However, at this time, there are only a few studies that demonstrate the efficacy of a nonsurgical platelet-rich plasma (PRP) injectable for intra-articular use in patients with knee osteoarthritis [9], [10]. PRP is being marketed as a "wonder drug," despite the fact that there is insufficient evidence to support its use in nearly all of the fields in which it is employed. This potential clinical trial was designed to evaluate the role of platelet-rich plasma (PRP) inthe early stages of osteoarthritis of the knee in light of these knowledge gaps.

Autologous platelet-rich plasma (PRP) was used in this study to infiltrate into the knee joints of patients with early osteoarthritis. The results of the injection of PRP were monitored over a period of time to determine whether or not the treatment was effective. A small number of patients were given normal saline injections, which served as control.

II. Materials And Methods:

STUDY DESIGN: open randomized control trial
STUDY AREA: Department of orthopaedics
STUDY PERIOD: September 2020-June 2022
STUDY POPULATION: 100 subjects
INCLUSION CRITERIA: Kellgren-Lawrence Grade 1, Grade 2, Grade 3A, Age of more than 35 years, Patient who gave consent for the study, Platelet count (minimum 2lakhs per microliter), Random blood sugar <160 mg/dl, Haemoglobin >10 gm%.

EXCLUSION CRITERIA: Platelet dysfunction syndrome, Critical thrombocytopenia <105/ml, Hypofibrinogemia, Septicemia and Active infection, Coagulopathies, Immune deficiencies, Patients with underlying diseases (rheumatoid arthritis, gout),Patients with vascular injuries.

STUDY TOOLS PROCEDURE:
Patients were evaluated using a predesigned proforma and clinical examination.Kellgren Lawrence grading of osteoarthritis was done.
Baseline BMI, WOMAC score, pain score, physical function score, stiffness score and Visual analogue score were calculated.
Patients were divided into 2 groups consisting of 50 patients each.
Patients in group A were given intra articular PRP and those in group B were given intra articular Normal saline.
Three follow ups were done once ; 1st visit at 6 weeks , 2nd visit at 3 months , 3rd visit at 6 months.
At each visit WOMAC score, pain score, physical function score, stiffness score, Visual analogue score were calculated.Data so collected was tabulated in an excel sheet, under the guidance of statistician. The means and standard deviations of the measurements per group were used for statistical analysis (SPSS 22.00 for windows; SPSS inc, Chicago, USA). Difference between two groups was determined using unpaired t-test and the level of significance was set at $p < 0.05$.

III. Results

The mean age is 49.92 in group A and 54.16 in Group B. Gender distribution in group A was 80 % males 20% females. In group B 82% were males and 18% were females. The mean Body mass index in group A was 26.97 and in Group B 26.64 . WOMAC Pre-injection WOMAC in group A was 74.2(pre-injection period), decreased to 62.46 (post-injection period), 47.68 (post-injection period), and 33.40 (post-injection period) at 6 weeks, 3 months, and 6 months, respectively. This demonstrates a statistically significant decrease in the overall WOMAC score over the course of the study. At 6 weeks and 3 months, the WOMAC score in group B showed a mean of 69.80, which decreased to 64.10 and 62.46 respectively at 6 weeks and 3 months, but then increased to 66.44 at 6 months after the injection.

WOMAC SCORE

		Pre injection	6wks	3 months	6months
PRP	N	50	50	50	50
	Mean	74.20	62.46	47.68	33.40
	SD	4.85	6.60	8.15	7.59
NS	N	50	50	50	50
	Mean	69.80	64.10	62.46	66.44
	SD	4.68	5.5	5.4	5.1
P Value		0.1804	0.001	0.001	0.001

PAIN SCORE

		Pre injection	6wks	3 months	6months
PRP	N	50	50	50	50
	Mean	16.58	11.32	7.44	5.34
	SD	3.08	2.76	1.93	1.42
NS	N	50	50	50	50
	Mean	16.30	13.74	13.66	15.46
	SD	2.39	2.3	2.3	1.9
P Value		0.6132	0.001	0.001	0.001

STIFFNESS SCORE

		Pre injection	6wks	3 months	6months
PRP	N	50	50	50	50
	Mean	5.50	4.60	3.78	3.40
	SD	1.22	1.20	1.09	1.14
NS	N	50	50	50	50
	Mean	5.16	4.56	4.46	4.78
	SD	0.93	0.81	0.73	0.84
P Value		0.1204	0.8453	0.004	0.001

PHYSICAL FUNTION SCORE

		Pre injection	6wks	3 months	6months
PRP	N	50	50	50	50
	Mean	52.12	46.54	36.46	24.62
	SD	3.77	4.53	6.49	6.33
NS	N	50	50	50	50
	Mean	48.30	45.80	44.38	46.20
	SD	3.17	3.9	3.8	3.6
P Value		0.3840	0.001	0.001	0.001

VISUAL ANALOG SCORE

		Pre injection	Post Injection
PRP	N	50	50
	Mean	7.2	3.06
	SD	0.97	1.24
NS	N	50	50
	Mean	6.86	4.98
	SD	0.81	0.89
P Value		0.0473	0.001

IV. Discussion

Orthoarthrosis is a synovial joint disorder characterised by the disruption of the delicate equilibrium that exists between cartilage regeneration and degeneration, which results in the proliferation of cells and the formation of new bone as well as the remodelling of joint surfaces. Osteoarthrosis is a vibrant repair process of synovial joints that can be initiated by any number of factors.

The use of biological agents, including PRP and mesenchymal stem cells (MSCs) in orthopaedics, has increased exponentially over the last few years due to its autologous nature, lack of side-effects, and supposed effectiveness. Platelet-rich plasma is an autologous blood product with platelet concentrations above baseline.

The present study was conducted in the department of orthopaedics, ASRAM medical college, Eluru among 100 subjects suffering from osteoarthritis to evaluate the role of intra-articular injection of autologous PRP i.e., platelet rich plasma. The recruited subjects were divided into 2 groups i.e Group A: 50 subjects (PRP was given) and Group B (Normal saline) was given.

AGE

Maximum subjects were from the age groups of 41-50 and 51-60 years. Age distribution shows that mean age is 49.92 in group A and 54.16 in Group B. Koshbin et al in their study found that the mean age of patients receiving PRP was 56.1 years in comparision with 57.1 years for the group receiving HA or NS[25]

GENDER

Gender distribution in group A was 80 % males 20% females. In group B 82% were males and 18% were females.

BODY MASS INDEX

The mean Body mass index in group A was 26.97 and 26.64 was the mean Body mass index in Group B.

WOMAC

Pre-injection WOMAC in group A was 74.2(pre-injection period), which decreased to 62.46 (post-injection period), 47.68 (post-injection period), and 33.40 (post-injection period) at 6 weeks, 3 months, and 6 months, respectively. This demonstrates a statistically significant decrease in the overall WOMAC score over the course of the study.

At 6 weeks and 3 months, the WOMAC score in group B showed a mean of 69.80, which decreased to 64.10 and 62.46 respectively at 6 weeks and 3 months, but then increased to 66.44 at 6 months after the injection.

These findings are similar to the study conducted by Sandeep Patel et al who divided patients with bilateral OA knee into 3 groups. Group was given single injection of PRP, group B two injections of PRP. WOMAC score was calculated at 3 weeks,3 months and 6 months. Significant improvement was noted in mean WOMAC scores in group A and B. in group C the mean WOMAC score increased . [1]

Spakova et al conducted a study in 2012 and gave 3 injections of PRP in one group, 3 injections of HA to another group. Statistically significant results in the WOMAC scores were recorded in a group of patients who received PRP injections after a 3- and 6-mo follow-up . [21]

Shen et al in 2017 conducted 14 Randomized control trials with 1423 patients and noted that PRP injections significantly reduced WOMAC sub scores as well as total WOMAC score at 3,6,12 months follow up. [26]

PAIN The mean pain score in group A decreased from 16.58 to 5.34 by the end of the 6- month follow-up period, whereas the mean pain score in group B decreased from 16.30 to 13.74 at six weeks but returned to 15.46 by the end of the 6-month followup period. The p-value obtained from the unpaired t-test indicated a statistically significant improvement

STIFFNESS At 3 and 6 months after the start of the study, there was a statistically significant difference in secondary stiffness between groups A and B.

PHYSICAL FUNCTION Physical function reduced in group A than baseline of 52.12 to 24.62 at 6 months follow-up, indicating a decline from the baseline. Group B showed decrease from 48.30 to 44.38 after three months, followed by an increase to 46.20 at the end of six months. Group C showed no such decrease.

VISUAL ANALOGUE SCORE (VAS) The mean visual analogue score decreased from 7.22 to 3.06, indicating that the patient's perception of pain has changed from intense pain (score 8) to mild annoying pain (score 2) in Group A, while there was no significant decrease in the perception of pain in group B(6.86 to 4. 98) Kon et al in 2010 conducted a study by giving PRP injections to patients with osteoarthritis Patients were clinically evaluated before and at the end of the treatment, and at 6 & 12 months follow-up. Clinical evaluation was done by IKDC, objective and subjective, and Euroqol (EQ VAS) were used. Statistically significant improvement was noted in all the scores .[22]

V. Conclusion

The decrease in the WOMAC score, Pain score, Stiffness score, Physical function score and visual analogue score in patients receiving intra articular PRP injections was statistically significant when compared to patients who received Normal saline injections. Thus injectable Platelet Rich Plasma may be considered a safe, effective addition to the present armamentarium for treating Osteoarthritis of knee.

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