



## GENICULAR NERVE BLOCK AND INTRA ARTICULAR INJECTION OF PLATELET RICH PLASMA (PRP) VERSUS INTRA ARTICULAR INJECTION OF PRP IN TREATMENT OF KNEE OSTEO ARTHRITIS

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### ABSTRACT

Osteoarthritis is a common rheumatologic crisis with an occurrence of 22% to 39%. So, the present study was conducted with the objective of comparing the efficacy of Genicular Nerve block (GNB) and Intra articular injection of Platelet Rich Plasma (PRP) Versus Intra-articular injection of PRP in the treatment of Patients with Grade I and II osteoarthritis of Knee. A prospective cohort study was conducted among patients referred to the Department of Physical Medicine and Rehabilitation at Government Institute of Rehabilitation Medicine, KK Nagar, Chennai, Tamil Nadu from January 2019 to December 2020. About 50 patients received GNB and intra-articular injection of PRP and the other 50 received intra-articular injection of PRP. Visual analog scale (VAS) and numeric pain rating scale (NPRS) were used to measure the pain before and after the intervention among study participants at various time intervals. Among the study participants, maximum (68) had grade II osteoarthritis and 32 had grade I osteoarthritis. Left knee was affected in 45 of them, right knee in 35 and bilateral involvement was observed in 20. Both VAS and NPRS pain scores showed a significant difference between the two groups with GNB+PRP group having a significantly lower score than the PRP group. There was a significant decrease in pain of osteoarthritis of knee when genicular nerve block and intra articular injection of platelet rich plasma were administered in grade I and grade II knee osteoarthritis patients.

**KEYWORDS :** knee osteoarthritis, genicular nerve block, intra-articular injection, platelet rich plasma

### INTRODUCTION

Arthritis is defined as swelling of a joint with features of pain, inflammation, and restriction of joint motions. Osteoarthritis (OA) is a continual degenerative illness of multi factorial causes with features of loss of articular cartilage, hypertrophy of bone at the borders, sub-chondral sclerosis, and range of biochemical and morphological changes of the synovial membrane and joint capsule<sup>[1]</sup>.

Osteoarthritis is a common rheumatologic crisis with an occurrence of 22% to 39%<sup>[2]</sup>. OA is common in women than men, but the incidence increases noticeably with age. Almost, 45% of females more than 65 years age have characteristic of OA while radiological evidence is established in 70% of those above 65 years. OA of the knee is a main cause of mobility impairment, mainly in females<sup>[3]</sup>.

At present, there are only a little treatment modalities for patients with mild to moderate arthritis. Most of the managements are palliative and are aiming to tackle the symptoms rather than influencing the biochemical aspect of the joint or the disease progression. Osteoarthritis particularly is a frequent disease which can be put under control by apt weight reduction and muscle strengthening exercise. But these modalities are always under the threat of poor adherence from the part of subject<sup>[4]</sup>.

Many scientific evidences suggest that osteoarthritis results from a disparity between pro and anti inflammatory cytokine. This cytokine difference is thought to trigger proteolytic enzymes, leading to the damage of cartilage. Many newly planned remedial measures for OA attempt to tackle this cytokine disparity. In addition to cartilage damage, arthritis of the knee joint may harmfully influence sub-chondral bone, synovium, ligaments, capsule, menisci, nearby musculature, and possibly the sensory nervous system<sup>[5]</sup>.

The recent treatments for OA tackle interleukin mediated biochemical progression of the disease. Some of the experimental ortho-biological treatments include platelet-rich plasma (PRP) injection graft therapy, high-concentrate PRP

(HcPRP), autologous bone marrow aspirate concentration and adipose cells, IL-1 receptor antagonist, nerve growth factor inhibitor, and osteogenic protein-1<sup>[6]</sup>.

Therefore, the present study was conducted with the objective of comparing the efficacy of Genicular Nerve block and Intra articular injection of Platelet Rich Plasma Versus Intra articular injection of Platelet Rich Plasma in the treatment of Patients with Grade I and II Osteo Arthritis of Knee.

### MATERIALS AND METHODS:

**Study Design:** A prospective cohort study was conducted among patients referred to the Department of Physical Medicine and Rehabilitation at Government Institute of Rehabilitation Medicine, KK Nagar, Chennai, Tamil Nadu from January 2019 to December 2020. Systemic random sampling method was followed and every fifth patient was included in the study till a minimum sample size of 100 was reached.

**Study Participants:** The study participants were randomly divided into two groups of 50 each. The control group received intra articular injection of Platelet Rich Plasma and the study group received genicular nerve block with 5% bupivacaine and intra articular injection of Platelet Rich Plasma. Both the groups underwent scheduled exercise therapy. Patients with grade I and grade II osteoarthritis knee by Kellgren- Lawrence grading,<sup>[7]</sup> knee pain unresponsive to conservative treatment for 1 month, and bony tenderness for more than 3 months were included in the study. Patients who were on steroid treatment, having any implants, cellulitis, trauma, and malignancy were excluded from the study. Informed written consent was obtained from each study participant before taking part in the study.

**Study Procedure:** Before the start of intervention, detailed history taking, and review of case file including investigations such as fasting blood sugar (FBS), post prandial blood sugar (PPBS), and X-ray knee were done and assessed to for any underlying medical conditions. Socio-demographic details were collected and anthropometric measurements were

collected. After getting informed consent, participants of both the groups were given a test dose of 2% Lignocaine.

**Intervention:** For both the group of patients, 34 ml (8.5ml X 4) of whole blood was collected in acid citrate dextrose tubes. First spin (soft spin) was done at 900g for 5 minutes. Supernatant plasma containing platelets was transferred into another sterile test tube (without anticoagulant). Second spin (hard spin) was done at 1000g for 10 minutes. Upper 2/3rd (platelet poor plasma) was pipetted out and the lower 1/3rd (Platelet rich plasma) platelet pellets was suspended in minimum quantity of plasma (2-4ml) by gently shaking the tubes.

After ensuring that there are no adverse reactions, the study participants were taken to the operation theatre and parts (according to intervention) was cleaned with surgical spirit followed by draping with sterile towel. Under strict aseptic precautions, the injection site is anaesthetized with 2% Lignocaine. For study group, genicular nerve (Superior medial genicular nerve, Superior lateral genicular nerve and Inferior medial genicular nerve) was blocked with 6ml of 0.5% Bupivacaine which is distributed equally to the targeted three injection sites under ultrasound guidance. Genicular nerve block was followed by Intra articular injection of 2-4ml of autologous platelet rich plasma by inferolateral approach. This procedure was repeated at regular 4 weeks interval for three cycles. In the control group, 2-4ml of Intra articular autologous platelet rich plasma by inferolateral approach. This procedure was repeated at regular 4 weeks interval for three cycles.

After the procedure, the study participants were observed for 15 minutes for any adverse reactions. Study participants were asked to report immediately in case of adverse reactions like post injection flare (increased pain, swelling)/hypersensitivity reactions etc. Both the groups underwent the Scheduled Exercise Therapy.

**Study Tool:** Pain relief was analyzed with visual analog scale (VAS) and numeric pain rating scale (NPRS)<sup>[8]</sup>. In these scales, the respondent selects a whole number from 0-10 that best reflects the intensity of pain with 0 being no pain and 10 being the worst possible pain. The scales were used before the intervention and on first post intervention day and also at 2 weeks, 4 weeks, 8 weeks, 12 weeks, 16 weeks and 24 weeks.

**Data Analysis:** Data was entered in Microsoft excel sheet and analyzed using SPSS software version 21. Chi-square test was used for categorical variables and unpaired t test was used for quantitative variables. Mann Whitney test was used in places where the data does not follow normal distribution. P value of less than 0.05 was considered to be significant in all these tests.

**Ethical Issues:** The study protocol was approved by the institutional ethical committee (IEC) before the start of the study. Informed written consent was obtained from each study participant in their local language. All the participants were followed up for 2 years for any adverse reactions.

**RESULTS:**

**Age and Sex Distribution:** The total number of study participants was 100. They were divided into two groups, 50 in genicular nerve block (GNB) and Intra articular injection of platelet rich plasma (PRP) and 50 in Intra articular injection of platelet rich plasma (PRP) group. The mean (SD) age of the GNB+PRP group and PRP group was 57.10(9.53) years and 57.90(8.89) years respectively. In both the groups, most of the study participants were in 50-59 years ((18(36%) in GNB+PRP and 21(42%) in PRP group)). Among 100 participants, 68 were females and 32 were males.

**Osteoarthritis Grading:** Among the study participants,

maximum (68) had grade II osteoarthritis and 32 had grade I osteoarthritis. They were equally distributed in both the groups. Left knee was affected in 45 of them, right knee in 35 and bilateral involvement was observed in 20. Both fasting and post-prandial blood sugars were found to be significantly more in the control group. These baseline characteristics of both the groups are illustrated in table 1.

**Table 1: Baseline characteristics of both the groups (n = 100)**

Variables	GNB+PRP	PRP	p value	
Age in years (SD)	56.78(9.70)	57.90(8.89)	0.39	
Gender	Male	22(68.8%)	10(31.2%)	0.010
	Female	28(41.2%)	40(58.8%)	
Grade of OA	Grade I	19(50%)	19(50%)	1.00
	Grade II	31(50%)	31(50%)	
Side affected	B/L, L>R	8(72.7%)	3(27.3%)	0.27
	B/L, R>L	5(55.6%)	4(44.4%)	
	Left Knee	23(51.1%)	22(48.9%)	
	Right Knee	14(40%)	21(60%)	
Systolic Blood Pressure	121.20(13.75)	121.04(13.54)	0.74	
Diastolic Blood Pressure	80.20(9.30)	80.68(8.64)	0.69	
Fasting Blood Sugar	93.86(21.29)	103.94(28.26)	0.019	
Post-prandial Blood Sugar	130.02(22.59)	139.32(33.62)	0.012	

VAS score among the study population: The pain as perceived by the study participants in the VAS was compared at different time intervals in both the groups. Mann Whitney test was used and it was found that there was significant difference in VAS score with GNB+PRP group having lower VAS scores than PRP group at different time intervals. The data is represented in table 2.

**Table 2: Comparison of VAS score among the two group across different time period**

	GNB+PRP Median (interquartile range)	PRP Median (interquartile range)	p value
1st day	2(1,2)	2(2,3)	0.001*
2 weeks	1(1,2)	2(1,3)	0.002*
4 weeks	1(1,2)	1.5(1,2)	0.009*
8 weeks	1(0,2)	1(1,2)	0.002*
12 weeks	0.50(0,1)	1(1,2)	<0.001*
16 weeks	0(0,1)	1(1,1)	<0.001*
24 weeks	0(0,1)	1(1,1)	<0.001*

Mann Whitney U test

NPRS score among the study population: Like VAS score, the NPRS score also showed a significant difference between the two groups with GNB+PRP group having a significantly lower score than the PRP group. Unpaired independent t test was used to compare the data between the two groups. The results are illustrated in table 3.

**Table 3: Comparison of NPRS score among the two group across different time period**

	GNB+PRP Mean ± SD	PRP Mean ± SD	Table value	p value
1st day	7.16±0.77	7.52±0.71	0.10	0.75
2 weeks	5.34±0.79	5.44±1.16	10.02	0.002*
4 weeks	3.56±0.67	4.12±0.79	0.19	0.67
8 weeks	2.54±0.58	3.68±0.84	7.43	0.008*
12 weeks	2.18±0.56	3.04±0.60	0.26	0.61
16 weeks	1.80±0.40	2.66±0.59	17.21	<0.001*
24 weeks	1.44±0.50	2.18±0.63	0.0	0.99

Independent t test

**DISCUSSION:**

The study was done to assess the efficacy of Genicular nerve block using local anaesthetic and PRP versus only PRP among patients suffering from grade I and II osteoarthritis of knee. The mean (SD) age of the GNB+PRP group and PRP group was 57.10(9.53) years and 57.90(8.89) years respectively. This result coincides with many studies where the average age falls between 55 to 60 years<sup>[9, 10]</sup>. The rise in occurrence of OA with age can be due to a variety of risk factors and biologic changes that happen with aging that may create a joint which is more susceptible to the adversities, such as cartilage thinning, reduced muscle strength and damage due to oxidative stress.

In our study, majority 68(68%) of the study subjects were females and 32(32%) of the subjects were males. About 28 (56%) and 40 (80%) of GNB + PRP and PRP groups respectively were females. This result of increased incidence of knee OA among females was also found in other studies which showed a reduced risk among men in case of knee OA<sup>[11, 12, 13]</sup>. The increased occurrence in post-menopausal age can be associated with hormonal changes or sudden change in weight for the females due to the hormonal changes.

The mean (SD) of the FBS was 93.86 (21.29) mg/dl for the GNB+PRP and 103.94 (28.26) mg/dl for the PRP. The minimum FBS was 66 mg/dl and Maximum was 178 mg/dl. The mean (SD) of the PPBS was 130.02 (22.59) mg/dl for the GNB+PRP and 139.32 (33.62) mg/dl for the PRP. The minimum PPBS was 98 mg/dl and Maximum was 259 mg/dl. The mean values of Systolic BP, diastolic BP, FBS and PPBS showed that there was reduced risk of hypertension and diabetes in this group.

There was a significant difference between the two groups across the time periods in terms of VAS score and NPRS score. GNB+PRP group showed better outcome in terms of decreased VAS score and NPRS score. Further, there was a significant difference between the two groups after 2 weeks, after 8 weeks and 16 weeks of intervention. These results are comparable with other studies where PRP showed a better result in terms of functional and quality of life compared to other modalities. Sánchez et al was initial one to report the intra-articular injection of plasma rich in growth factors to prevent articular cartilage damage<sup>[14]</sup>.

The study is not without limitations. The pain scores were only subjective and may have bias. Further, only grade I and II osteoarthritis patients were included and severe OA (grade III and grade IV) patients were not included in the study. But, this study can be used as a reference to conduct large scale clinical trials to evaluate the effectiveness of genicular nerve block with intra-articular injection of platelet rich plasma in the treatment of refractive osteoarthritis of knee.

**CONCLUSION**

There was a significant decrease in pain of osteoarthritis of knee when genicular nerve block with 5% bupivacaine and intra articular injection of platelet rich plasma were administered in grade I and grade II knee osteoarthritis patients.

**CONFLICT OF INTEREST:** None

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