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Effect of platelet rich plasma in osteoarthritis knee-A short term follow up

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Abstract

Introduction: Osteoarthritis (OA) is a painful chronic degenerative joint. As of now, there are less options available for patients with mild to moderate arthritis. Most of the approaches are palliative and address the symptoms rather than influencing the biochemical environment of the joint or the disease process. PRP is a newer treatment option emerging in the recent times and its efficacy needs to be examined in our population and hence the study.

Materials and Methods: It is a prospective, observational, time bound, hospital-based study conducted from November 2017 to May 2019, after obtaining institutional Ethical committee approval. 60 primary OA knee joints, included in this study, selected from R L Jalappa Hospital and Research centre, Department of Orthopaedics, Kolar. Autologous PRP prepared and infiltration was done under strict aseptic conditions. Patients assessed with WOMAC scoring & VAS for pain, before giving the PRP injection & after giving the injection at periods of 1 month, 3 & 6 months. The decrease in WOMAC & VAS scores was suggestive of improvement in patient's condition.

Results: Significant difference was observed in mean VAS and WOMAC total scores. No local or systemic complications noted during the study period. The mean VAS score at baseline was 7.08 ± 0.79 and the decrease in mean VAS score continued up to six months follow-up that is 2.78 ± 1.22 (P value < 0.001). The mean WOMAC Total at baseline was 66.20 ± 7.63 and the decrease in mean WOMAC Total continued up to six months follow-up that is 19.95 ± 11.69 (P value < 0.001).

Keywords: Osteoarthritis, plate let rich plasma (PRP), ahlbacks's, WOMAC, VAS

Introduction

Osteoarthritis (OA) is a painful chronic degenerative joint disease characterised by structural changes of the whole joint, which includes loss of articular cartilage, along with development of osteophytes, synovial inflammation, subchondral bone changes, meniscal damage, muscle weakness, and ligamentous laxity. OA is as a result of complex interplay involving genetic, metabolic, biomechanical, and biochemical factors [1].

It is very common and debilitating disease, associated with a large social and economic burden [2]. Osteoarthritis of the knee joint is the fourth leading cause of 'years lived with disability' (YLD) and accounts for 3% of total global YLD's [3].

Current theories state that the disease progression is as a result of imbalance between pro inflammatory cytokines (including interleukin IL-1 α , IL- β , and tumour necrosis factor- α & anti-inflammatory cytokines (including IL-4, IL-10, & IL-1ra). The resultant cytokine imbalance is believed to activate the proteolytic enzymes, leading to destruction of articular cartilage [4].

As of now, there are less options available for patients with mild to moderate arthritis. Most of the approaches are palliative and address the symptoms rather than influencing the biochemical environment of the joint or the disease process [5]. Current pharmacotherapy of OA, such as analgesics, non-steroid and steroid anti-inflammatory drugs, glucosamine, chondroitin sulphate, and hyaluronic acid (HA), are predominantly directed toward the symptomatic relief of pain and inflammation, but they do little to reduce joint cartilage degeneration [6].

Platelet-rich plasma (PRP) is defined as the autologous concentration of human platelets in a small volume of plasma, where platelet concentration is higher (typically up to five times higher) than the normal platelet concentration [7]. PRP also includes concentration of several

fundamental protein growth factors (GF) proved to be actively secreted by platelets to initiate mesenchymal tissue healing. These growth factors not only stimulate cell proliferation, differentiation, migration but also helps in matrix synthesis along with chondrocyte metabolism, chondrogenesis and improve cartilage healing *in vivo* [8].

By delivering very high concentrations of cytokines & growth factors (GF) to damaged tissues in the form of PRP, is considered to have a proven beneficial effect both on tendon and cartilage tissue regeneration [9]. In OA involving knee joint, the main aim of PRP is not only to promote cartilage repair and relieve osteoarthritic symptoms but also in potentially delaying the need for joint replacement surgery [10].

In view of these grey areas regarding our understanding and knowledge, this study is being designed to evaluate, the role & efficacy of PRP in early stages of knee osteoarthritis. PRP is a newer treatment option emerging in the recent times and its efficacy needs to be examined in our population and hence the study.

AIM & Objectives of the Study

To assess the functional outcome and reduction of pain after Intra articular injection of PRP in mild osteoarthritic knee joints.

To assess the complications associated with PRP infiltration in the osteoarthritis knee joints.

Material and Methods

It is a prospective, observational, time bound, hospital-based study conducted from November 2017 to May 2019, after obtaining institutional Ethical committee approval. 60 primary OA knee joints, included in this study, selected from R L Jalappa Hospital and Research centre, Department of Orthopaedics, Kolar, on outpatient and in-patient basis who meets inclusion criteria.

After clinical examination & radiographs of the knee joint in standing position (antero-posterior views and lateral views) were taken, after taking Informed & written consent blood sample of the patient was collected and PRP prepared in Blood bank. Infiltration was done in Operation theatre under strict aseptic conditions.

Patients assessed with ‘WOMAC’ (Western Ontario McMaster Universities Arthritis Index) scoring & ‘VAS’ (visual analogue scale) for pain, before giving the PRP injection & after giving the injection at periods of 1 month, 3 & 6 months. The decrease in WOMAC score & VAS score was suggestive of improvement in patient’s condition.

As we have not found any literature for grading the results of WOMAC score, hence we have graded it to quantify the results. Outcome measured is quantified in percentage of improvement.

85-100% improvement-excellent

70-84% improvement-good

55-69% improvement-fair

<55% improvement-poor.

The Statistical software namely SPSS 22.0, and R environment ver.3.2.2 were used for the analysis of the data and Microsoft word and excel have been used to generate graphs, tables etc.

Inclusion Criteria

Patients of primary osteoarthritis of knee joints with Ahlback's radiological grade I and II.

Exclusion Criteria

Patients of secondary osteoarthritis of knee joints like post traumatic, inflammatory arthritis.

Patients with active infections around knee joints.

Platelet counts <1 lakh.

Procedure of PRP Injection

In operation theatre, the patient in supine position, knee was thoroughly scrubbed, & painted after that sterile draping techniques followed. Then the patients knee in slight flexion so that joint is opened for injection using lateral parapatellar approach.

Under sterile aseptic conditions, about 5mL platelet concentrate was injected into knee joint using 18-gauge needle without using any local anesthetic. Post injection of PRP passive knee movements (flexion and extension) were performed. After the procedure, Jone’s compression bandage was applied and the knees were immobilized for ten minutes. Patients were then observed for thirty minutes for possible side effects like sweating, dizziness. During follow-up period, no analgesics were allowed.



Fig 1: Vacutainers following 15 minutes of centrifuge with 1500 RPM.



Fig 2: PRP in a 10 ml syringe.



Fig 3: Infiltration of PRP in to knee joint.

Results

The mean age of subjects in the study was 57.87 ± 11.15 years and majority of the patients were females (60%). Right side (63.3%) was more commonly involved than left (36.7) and 38.3% patient are grade I osteoarthritis whereas 61.7% patients are grade II osteoarthritis.

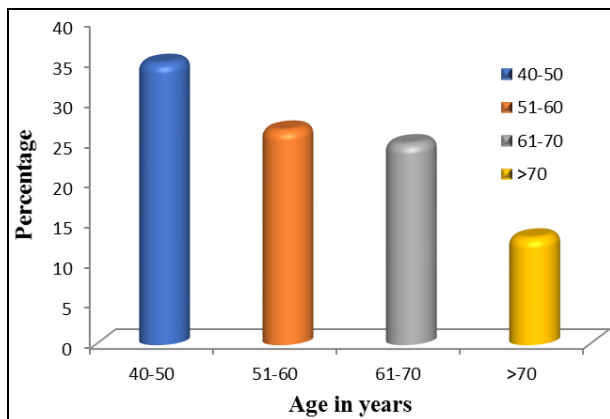


Fig 4: Bar diagram showing Age.

Significant difference was observed in mean VAS and WOMAC total scores.

Table 1: Mean VAS Score.

VAS Score	Min-Max	Mean ± SD	difference	t value	P value
0 day	6.00-8.00	7.08±0.79	-	-	-
1 month	4.00-7.00	5.37±0.76	1.717	27.121	<0.001**
3 months	2.00-7.00	4.07±0.97	3.017	27.377	<0.001**
6 months	1.00-6.00	2.78±1.22	4.300	27.492	<0.001**

Student t test (paired)

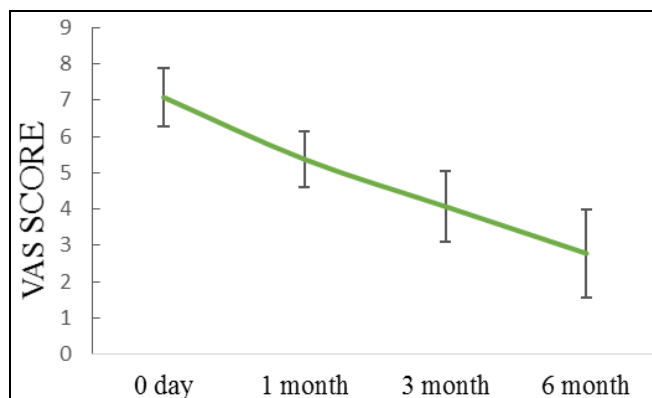


Fig 5: Graph showing Mean VAS Score.

Table 2: Mean WOMAC Total.

WOMAC Total	Min-Max	Mean ± SD	difference	t value	P value
0 day	44.00-83.00	66.20±7.63	-	-	-
1 month	32.00-73.00	48.97±7.82	17.233	23.643	<0.001**
3 months	18.00-63.00	33.78±9.55	32.427	30.350	<0.001**
6 months	7.00-54.00	19.95±11.69	46.250	31.700	<0.001**

Student t test (paired)

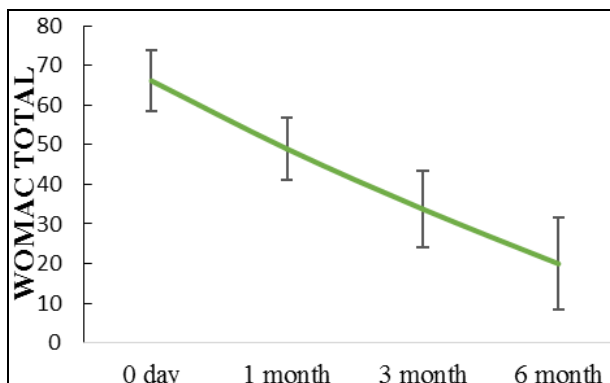


Fig 6: Graph showing Mean WOMAC Total.

As we have given a working classification to assess the results, 6 (10%) joints have shown excellent results, 29(48.3%) joints have shown good results, 18(30%) joints have shown fair results and 7(11.7%) joints have shown poor results, among excellent results 5(27%) were Grade I and one (2.7%) Patient Grade II. No local or systemic complications noted during the study period.

Table 3: Grade of Result in total subjects.

Grade Result	No. of patients	%
Excellent	6	10.0
Good	29	48.3
Fair	18	30.0
Poor	7	11.7
Total	60	100.0



Fig 7: Bar diagram showing Grade of Result in total subjects.

Discussion

Articular cartilage lesions and degeneration are difficult to treat and present a challenge for orthopaedic surgeons because of the distinctive structure and function of hyaline cartilage and its inherent low healing potential.

This prospective observational study was performed to know the effectiveness of the PRP in 60 early osteoarthritis knee joints. Single autologous PRP injection was given. The efficacy of Platelet rich plasma in reducing pain, stiffness and physical function were assessed pre-injection and post-injection period on first month, third month and sixth month using WOMAC & VAS scores.

Age Distribution: In this study the average age documented was 57.87±11.15 years which was comparable to findings of studies conducted by, Rayegani *et al.* [11], in 2014 and Raeissadat *et al.* [12], in 2015.

Sex Distribution: The male: female ratio in this study is 24:36. Most authors have documented female preponderance.

Knee Joint Side Distribution: In our study Right knee joint is most commonly involved with 63.3% than that of left knee joint 36.7%, similar to studies done by Cerza *et al.* [13], in 2012 and patel *et al.* [14], in 2013.

In this study, all the patients have shown decrease in their mean VAS scores. The mean VAS score at baseline was 7.08 ± 0.79 and the decrease in mean VAS score continued up to six months follow-up that is 2.78 ± 1.22 (P value <0.001) similar to the studies done by Patel *et al.* [14], in 2013 and Kavadar *et al.* [10], in 2015 and Çaliş *et al.* [15], in 2015.

The mean WOMAC Total at baseline was 66.20 ± 7.63 and the decrease in mean WOMAC Total continued up to six months follow-up that is 19.95 ± 11.69 (P value <0.001) similar to the studies done by Patel *et al.* [14], in 2013,

Raeissadat *et al* [12], in 2015 and Fawzy *et al* [16], in 2017.

The improvement in mean VAS AND WOMAC scores in our patients could be explained by the fact that injected platelets might have acted at different levels and were stimulating the chondral anabolism or slowing the catabolic process.

There is a significant difference observed in Grade I and Grade II mean VAS scores. The mean VAS score in Grade I reduced from baseline (6.78±0.67) to final follow-up (2.17±0.89) compared to Grade II which reduced from baseline (7.27±0.80) to final follow-up 3.16±1.26 with significant change in P value.

There is a significant difference observed in Grade I and Grade II mean WOMAC TOTAL scores. The mean WOMAC TOTAL score in Grade I reduced from baseline (62.35±4.68) to final follow-up (14.22±4.26) compared to Grade II which reduced from baseline (68.59±8.16) to final follow-up (23.51±13.38) with significant change in P value.

Complications

Immediate post infiltration, few patients have complained of pain, but no local or systemic complications noted during our study.

Conclusion

There are less treatment options available for patients with mild to moderate osteoarthritis knee. Most of the approaches are palliative and address the symptoms rather than influencing the biochemical environment of the joint or the disease process. Even though few studies suggest the use of multiple injections of PRP for early OA, but we observed that our results from usage of single PRP injection are comparable with them. We also observed that younger the patient and less severe the grade, better the results. We can safely conclude that autologous PRP injection in early Osteoarthritis (Grade I and Grade II) does give relief from pain, stiffness and improves functionality without any major side effects and can be recommended as a viable modality of treatment. PRP is easy and convenient to extract, and processing is relatively simple and short, easy handling and offers multiple GFs at relatively inexpensive cost. Above all, its use is safe, and the results are easily reproducible with no or minimal complications.

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Conflicts of Interest: There are no conflicts of interest.

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