Original Research Article

Effectiveness of intra-articular injection of platelet-rich plasma versus triamcinolone in osteoarthritis of knee – A hospital-based randomized clinical trial

Rajendra B Uppin¹,², Nitish K³, Gangadhar Bhuti¹,², S K Saidapur¹,²,*
Satish Bachchu¹,²

¹ Dept. of Orthopaedics, J N Medical College, KLE Academy of Higher Education and Research (KAHER), Belgaum, Karnataka, India
² KLES Dr. Prabhakar Kore Hospital & M.R.C, Belgaum, Karnataka, India
³ Dept. of Orthopaedics, Subbaiah Institute of Medical & Dental Sciences, Shivamogga, Karnataka, India

A R T I C L E I N F O

Article history:
Received 06-05-2021
Accepted 01-06-2021
Available online 24-06-2021

Keywords:
Platelet Rich Plasma
Triamcinolone
Osteoarthritis of knee
Intraarticular injections

A B S T R A C T

Introduction: Osteoarthritis of the knee is one of the most common conditions which clinicians have to deal with in their day-to-day practice. There are various pharmacologic therapies recommended for OA knee. Intra-articular Platelet Rich Plasma (PRP) and Intra-articular Triamcinolone have been shown to relieve pain and improve quality of life in patients with OA knee. This study is conducted to compare the effectiveness of PRP and Triamcinolone intra-articular injections in Grade 1 & 2 OA knee.

Materials and Methods: We conducted a randomized control study including 70 patients with Grade 1 & 2 (Kellgrenn & Lawrence grading) OA knee. 35 patients each were divided into the PRP group and Triamcinolone group. Intra-articular PRP 5ml and Intra-articular Triamcinolone 80mg were injected twice 3 weeks apart. The effectiveness of the treatment was evaluated by using VAS, KOOS, and WOMAC scores at 3 weeks, 3 months, and 6 months of the follow-up period.

Results: At 3 weeks follow up both the groups showed similar results decreasing pain and improving quality of life. At 6 months follow-up, the PRP group showed better results, and the same effect was observed at 6 months of follow-up. Overall, the PRP group showed better VAS, KOOS, and WOMAC scores compared to the Triamcinolone group.

Conclusion: In the present study both the groups showed improvement in function and reduction in pain in patients with Osteoarthritis of the knee but Triamcinolone had a short-term effect compared to PRP. The study showed the effect of intra-articular injection of platelet-rich plasma was better than triamcinolone in early osteoarthritis of the knee.

This is an Open Access (OA) journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

Osteoarthritis is classically described as a non-inflammatory, degenerative joint disease most commonly occurring in the elderly population. According to the American College of Rheumatology (ACR), Osteoarthritis is defined as a “Heterogeneous group of conditions which may lead to joint symptoms and signs associated with defective integrity of underlying bones and joint margins”. It is an inherently noninflammatory disorder of movable joints characterized by deterioration of articular cartilage and by the formation of new bone and joint surfaces and margins.¹ The causes of osteoarthritis are believed to be multifactorial including genetic, environmental, metabolic, and biomechanical. Risk factors that are associated with OA knee mostly are old age, obesity, gender, low bone mineral density, joint hyper-mobility, instability, joint trauma,

https://doi.org/10.18231/j.ijor.2021.003

2581-8112© 2021 Innovative Publication, All rights reserved.
immobilization, diabetes mellitus, occupation, sports activities, genetic factors, and proprioceptive deficit. An array of evidence shows that OA knee is treated with surgical, pharmacological, and non-pharmacological interventions. Treatment of OA knee is directed towards reducing joint pain and stiffness, maintaining and improving joint mobility, reducing physical disability and handicap, improving health-related quality of life, limiting the progression of joint damage, educating patients about the nature of the disorder and its management. The pharmacological line of treatment included drug therapy like Acetaminophen, Non-Steroidal Anti-Inflammatory drugs (NSAIDs), NSAIDs along with PPI, Misoprostol, COX-2 inhibitors, Topical NSAIDs, capsaicin, oral analgesic, anti-inflammatory agents, injections of IA hyaluronate glucosamine and/or chondroitin sulfate, opioids and narcotic analgesics.

The intra-articular PRP and Triamcinolone have shown to be effective in treating the early OA knee. The rationale of this study was to evaluate the effectiveness of both and helping the treating clinicians to opt for a better mode of management among the two.

2. Objectives of Study

To assess clinically, the reduction in pain, stiffness, and improvement in functional outcomes in patients injected with intra-articular injections of Platelet Rich Plasma v/s Triamcinolone in Grade I and Grade II Osteoarthritis of knee. [Kellgren and Lawrence Grading].

3. Materials and Methods

This is a randomized clinical trial conducted over one year from January 2016 to December 2016 in the department of orthopedics, KLE’S Dr. Prabhakar Kore Hospital and Medical research center, Belagavi attached to KAHER’s Jawaharlal Nehru Medical College, Belagavi. Seventy subjects of both genders of all age groups treated 35 subjects with triamcinolone and 35 subjects with PRP included in this study. Demographic data such as age, sex, and history is obtained through an interview and grade of osteoarthritis decided with the help of plain anteroposterior and lateral radiography of the knee. These patients were further subjected to clinical examination and finding such as grade and extent were noted on a predesigned and pretested proforma.

3.1. Inclusion criteria

Grade I and Grade II Osteoarthritis of knee diagnosed by taking X-rays of the affected knee on standing position based on Kellgren and Lawrence grading of osteoarthritis of the knee. Aged between 40 and 70 years.

3.2. Exclusion criteria

Patients excluded from this study are critical thrombocytopenia, hemodynamical instability or septicemia, septic arthritis, overlying cellulitis or adjacent osteomyelitis, platelet dysfunction syndrome, patients on antiplatelet drugs, diabetes, rheumatoid arthritis, nonspecific arthritis, corticosteroid or hyaluronic acid injection of the knee within 1 month or systemic corticosteroid use within 2 weeks, recent fever or illness, cancer, particularly of bone or malignancy.

3.3. Outcome measurement

Patients were prospectively evaluated basally and at 3 weeks, 3 months, and 6 months of follow-up using VAS, KOOS, and WOMAC scores.

3.4. Procedure

After obtaining ethical clearance from the institutional ethical committee and informed written consent, the participants were screened based on the inclusion and exclusion criteria. Sample allocation in the two groups was done based on envelop method. Demographic data, Visual Analogue Scale, KOOS Scale, and WOMAC scale were documented. The subjects were randomly allocated into 2 groups namely the PRP group and TRIAMCINOLONE group.

PRP group patients were injected with intra-articular injection of PRP prepared from their blood inside the operating theater with all aseptic precautions using the superolateral approach to the knee joint. About 5ml of PRP was injected into the suprapatellar pouch twice at an interval of 3 weeks.

3.5. PRP preparation

The PRP required for injection was prepared by drawing the patient’s venous blood of about 40ml under aseptic precautions.

The blood was collected in a BD Vacutainer® Coagulation Tubes (Buffered Sodium Citrate) 67599 KFK022 4.5 CTAD (0.109M). The tubes were then centrifuged first at 1500 rpm for 6 minutes to separate erythrocytes, and a second at 3500 rpm for 15 minutes to concentrate platelets produced around 5ml of PRP.

Triamcinolone group was injected with 80mg of intra-articular injection of PRP prepared from their blood inside the operating theater with all aseptic precautions using the superolateral approach to the knee joint. About 5ml of PRP was injected into the suprapatellar pouch twice at an interval of 3 weeks.

3.6. Statistical methods

The primary outcome variables: VAS, KOOS components, and overall score by WOMAC score were consider as the outcome parameters.
Primary explanatory variable: Study group A=PRP and B=TRIAMCINOLONE.

Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency, and proportion for categorical variables.

Both the study group were compared concerning baseline characteristics like gender, side involved and grade of OA by cross-tabulation, and a comparison of percentages with 95% CI is presented. The Chi-square test was used to test statistical significance and represented using the graph in the trend line.

The association between the study group and VAS, KOOS pain, KOOS symptom, KOOS Activities Of Daily Living, KOOS sports/rec, KOOS Quality Of Life, WOMAC scores was assessed by comparing the mean values. The mean differences along with their 95% CI were presented.

P-value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.

4. Results

The participants with right knee affected were 23 (65.71%) in the PRP group and 22 (62.86%) in the Triamcinolone group and left knee affected were 12 (34.29%) in the PRP group and 13 (37.14%) in the steroid group. The PRP group and the triamcinolone group, both received two doses of respective intraarticular injections at 3 weeks intervals. In our study, the right knee is affected most commonly than the left one.

The percentage of Kellgren and Lawrence radiograph classification for grade I was 54.29% in the PRP group, 40% in the triamcinolone group, and that for grade II was 45.71% in the PRP group, 60% in the triamcinolone group.

Outcome measures in the present study were VAS for pain and two functional assessment questionnaires.

The VAS scores were comparable during the pre-intervention period. As shown in Table 1 - The scores decreased in both the groups at 3 weeks of follow up suggesting there was pain relief among both the groups, indicating both interventions were equally effective at 3 weeks to follow-up. At 3 months the PRP group VAS scores were less compared to the Triamcinolone group suggesting PRP gave more relief which was statistically significant. The same trend was observed in the 6th month showing the PRP group had better pain relief in long-term follow-up. shows the decreasing VAS scores in both the groups but the PRP
The present study was conducted to compare the effectiveness of intra-articular injection of Platelet Rich
| KOOS Pain | PRP (N=35) | Triamcinolone (N=35) | P-value |
|-----------|------------|----------------------|---------|
| Pre-treatment | 71.14 ± 3.56 | 69.21 ± 4.44 | 0.060 |
| 3rd week | 80.57 ± 4.02 | 76.59 ± 2.96 | <0.001 |
| 3 months | 84.54 ± 4.85 | 80.08 ± 2.28 | <0.001 |
| 6 months | 87.56 ± 2.76 | 80.87 ± 2.68 | <0.001 |

Table 3: Comparison of mean of WOMAC between two study groups at different follow-up periods (N=70)

| WOMAC | PRP (N=35) | Triamcinolone (N=35) | P-value |
|-------|------------|----------------------|---------|
| Pre treatment | 49.23 ± 8.24 | 51.89 ± 7.6 | 0.165 |
| 3rd week | 44.91 ± 7.61 | 44.45 ± 9.23 | 0.817 |
| 3 months | 37.00 ± 5.23 | 40.43 ± 6.21 | 0.015 |
| 6 months | 35.77 ± 6.32 | 39.8 ± 6.24 | 0.009 |

Plasma versus Triamcinolone, clinically in terms of reduction in pain and stiffness and improvement in function, quality of life in Grade I and Grade II Osteoarthritis of knee, but as per the available literature Raeissadat et al., in their randomized clinical trial comparing intra-articular injections of PRP with HA reported similar fall in WOMAC scores at 52 weeks of follow up with decrement more in PRP group (p<0.001) which is comparable to our study. In a systematic review done by Campbell et al., functional assessment done with WOMAC total score suggested of significantly increased function at both 3rd and 6th month after the intervention while sustaining improvements up to 48 weeks post-PRP injections, recommending PRP injections in OA knee.

Studies have shown that the right knee is most affected in men aged 60 and above. In the women population there is an even distribution among right knee (24.2%) and left knee (24.7%), Our study showed right knee affected more than left.

The VAS has been studied for reliability and validity in patients with chronic musculoskeletal pain. It is shown to have good reliability (0.60 to 0.77) and validity (0.16 to 0.51) for assessing chronic musculoskeletal pain. In 2013, Patel et al., in their randomized control trial reported similar trends in the fall of VAS scores like our results which were significant between the groups when comparing PRP injections with placebo injections, and the recommended PRP injection in the early OA knee.

The KOOS subscale results when compared with a study done by Joshi Jubert, Nayana et al, comparing PRP with corticosteroid followed similar trends on the graph in terms of pain relief, symptoms, activities of daily living, sports, and recreational activities without any significant difference between the outcome of two groups under the KOOS scales, whereas our results showed a significant difference in outcome between two groups. On the contrary, the quality of life scores improved in their study compared to ours wherein there was no significant difference between the two groups, and concluded that PRP injection is effective for relieving pain, improving quality of life and activities of daily living even in the late stage of OA knee.

The KOOS results in a study conducted by Abeer H Ismaiel showed improvement concerning pain, ADL, and quality of life in the PRP group compared to the steroid group. In our study, the findings concerning pain and ADL are similar to his study but the quality of life showed better in the steroid group at 6 months follow-up.

The PRP group showed statistically significant improvement in all outcome measures when pre and post-intervention values were compared. The possible mechanism for the effectiveness of PRP was the active participation of platelets by delivering a broad spectrum of growth factors like insulin-like growth factor, transforming growth factor b-I, platelet-derived growth factor, and many other active molecules like cytokine, chemokines, arachidonic acid metabolites, extracellular matrix proteins, nucleotides, and ascorbic acid, etc. in the healing process. The release of the above-mentioned growth factors results in crucial changes in cartilage-like cell proliferation, migration, chemotaxis, differentiation, modulating inflammatory process, and matrix synthesis.

6. Conclusion

In the present study both the groups showed improvement in function and reduction in pain in patients with Osteoarthritis of the knee but Triamcinolone had a short-term effect compared to PRP. The study showed the effect of intra-articular injection of platelet-rich plasma was better than triamcinolone in early osteoarthritis of the knee.

7. Source of Funding

No financial support was received for the work within this manuscript.
8. Conflict of Interest

The authors declare they have no conflict of interest.

References

1. Hosper RF. Osteoarthritis; a disease of joint as an organ. *Arthritis Rheumatism*. 2012;64:1697–707.
2. Jordan J, Kington R, Ne L, Nevitt M, Zhang Y, Sower M, et al. Systemic Risk Factors For Osteoarthritis. *Ann Intern Med*. 2000;133(8):637–63.
3. Zhang W, Moskowitz RW, Nuki G, Abramson S, Altman RD, Bierma-Zeinstra S, et al. InterOArthritisRecommendation For The Management Of Hip And Knee Osteoarthritis, Part 2: OArthritis Evidence-Based, Expert Consensus Guidelines. *Osteoarthritis Cartilage*. 2008;16(2):137–62.
4. Ismaiel AH. Comparison between the effect of intra-articular injections of platelet-rich plasma and corticosteroids in advanced knee osteoarthritis. *J Med Sci Res*. 2018;1(4):278–84. doi:10.4103/jmisr.jmisr_66_18.
5. Glynn LG, Mustafa A, Casey M, Krawczyk J, Galvin R, Blom J, et al. Injectable Corticosteroid and Local Anesthetic Preparations: A Review for Radiologists. *Radiol*. 2009;252(3):647–61. doi:10.1148/radiol.2523081929.
6. Pitzer AI, Richmond JC, Kraus VB. Safety and Efficacy of Repeat Administration of Triamcinolone Acetonide Extended-release in Osteoarthritis of the Knee: A Phase 3b, Open-label Study. *Rheumatol Ther*. 2019;6(1):109–24.
7. Campbell KA, Saltzman BM, Mascarenhas R, Khair MM, Verma NN, Bach BR, et al. Effect of Intra-articular Triamcinolone vs Saline on Knee Cartilage Volume and Pain in Patients With Knee Osteoarthritis. *JAMA*. 2017;317(19):1967–75. doi:10.1001/jama.2017.5285.
8. Ayhan E, Kesmezacar H, Akgun I. Intra-articular injections (corticosteroid, hyaluronic acid, platelet rich plasma) for the knee osteoarthritis. *World J Orthop*. 2014;5(3):351–61. doi:10.5312/wjo.v5.i3.351.

Author biography

Rajendra B Uppin, Professor
Nitish K, Assistant Professor
Gangadhar Bhuti, Senior Resident
S K Saidapur, Associate Professor
Satish Bachchu, Junior Resident

Cite this article: Uppin RB, Nitish K, Bhuti G, Saidapur SK, Bachchu S. Effectiveness of intra-articular injection of platelet-rich plasma versus triamcinolone in osteoarthritis of knee – A hospital-based randomized clinical trial. *IP Int J Orthop Rheumatol* 2021;7(1):6-11.