



Intra-Articular Platelet-Rich Plasma Vs Corticosteroids in The Treatment of Moderate Knee Osteoarthritis: A Randomized Controlled Study

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Abstract

Aim: The study aim is to assess whether platelet rich plasma (PRP) is an effective treatment for mild to moderate knee osteoarthritis (OA) and compare its efficiency with Corticosteroid treatment in terms of pain control, physical function and quality of life.

Methodology: Fourty patients affected by symptomatic radiologically confirmed knee osteoarthritis (Kellgren-Lawrence grade II-III) were enrolled in this randomized study.

Patients randomized in the PRP group (n=20) received an intra-articular injections of PRP (8 mL), while patients allotted in the CS group (n=20) received an intra-articular injection of triamcinolone acetonide (1 mL of 40mg/mL) with Lidocaine (5mL Of 2%).

Evaluation: The pain and function of the target knee were evaluated by VAS scales and Knee Society Scoring at the baseline, 1 week, 1 month, 3 months, 6 months and 1 year after treatment.

Conclusion: Single PRP or CS intra-articular injection is safe and improves the short-term scores of pain and the knee function in patients affected by symptomatic knee OA. PRP demonstrated a statistically significant improvement over CS in a 1 year follow up.

Keywords: Osteoarthritis, Knee, Platelet-rich plasma, Corticosteroid

Introduction

Osteoarthritis is a chronic, progressive disease with high disability and teratogenicity in the joints. Osteoarthritis particularly in the knee, presents a significant and growing challenge for developed nations with ageing populations. Studies have shown that knee Osteoarthritis is a major contributor to dependency in everyday activities like walking and climbing stairs². To mitigate this growing public health issue, preventing the onset and progression of Osteoarthritis is crucial. People with osteoarthritis of the knee typically experience recurrent swelling, stiffness, and pain. The range of motion in the

knee joint may become restricted, and some individuals may develop an angular deformity¹. Many Osteoarthritic knees exhibit some degree of instability, ligamentous laxity, medial joint line tenderness, varus deformity, or contracture, or even a combination of these. X-rays, including standing anteroposterior, lateral, and skyline views, are used to diagnose osteoarthritis. Magnetic resonance imaging which is highly sensitive and can show early cartilage damage and help to detect early Knee osteoarthritic cartilage lesions, arthrography which has advantages of less trauma and quicker recovery helps in diagnosis as well as treatment of knee joint disorders by removing loose bodies, high-frequency color ultrasound which is non-invasive, fast and affordable imaging technique for diagnosis and thermal texture maps which help in recognising any pathology based on temperature changes are the most acceptable types of imaging examinations². These examinations not only help to diagnose Knee Osteoarthritis but they can also assess the severity of joint damage and determine the most suitable treatment options for each individual, both in clinical practice and research settings^{3,4}. Treatment options for Osteoarthritis of knee depends upon the severity of osteoarthritis. The options include the Traditional medicines like Non-steroidal Anti-inflammatory Drugs and Articular Cartilage Protection Drugs like Glucosamine and Chondroitin Sulfate which stimulate cartilage synthesis and inhibit its breakdown. Non-surgical options include Intra-articular injections like Corticosteroids, Hyaluronic acid and Platelet Rich Plasma. Offloading braces and Arthroscopic debridement to remove damaged joint tissue. Surgical options for cartilage repair (for focal defects) include Bone marrow stimulating techniques like Mosaicplasty, Osteochondral allograft transplantation. Other surgical options include

High Tibial Osteotomy which is suitable for younger patients with less severe Osteoarthritis knee and good joint stability. For very severe Osteoarthritis knee we have Joint replacement options.

The intra-articular (IA) infiltration of corticosteroids provides a short-term reduction in OA pain, and it is considered as an adjunct to core treatment for the relief of moderate to severe pain in people with OA^[5]. This approach, however, has limited efficacy in delaying disease progression, as well as undesirable potential side effects when administered in high doses and frequency^[6,7]. In this context, PRP is proposed as a potential treatment, capable of improving the clinical condition of patients with osteoarthritis^[8-13]. A limited number of publications in PRP, in which PRP has been

Compared to corticosteroid for the treatment of early knee OA, are available in the literature^[14-16]. To address these concerns this study was designed to compare the efficacy of a single intra-articular dose of PRP compared to corticosteroids for the treatment of moderate knee OA. The objective

of this study is to evaluate the clinical benefits of PRP when injected into the intra-articular space compared to a corticosteroid (triamcinolone acetonide), which is a recognized pharmacological treatment in patients with mild to moderate symptomatic knee OA. We hypothesized that intra-articular injection of PRP reduces pain in a very short term (1-week follow-up), similar to triamcinolone acetonide^[17], and it leads to an equal or more effective analgesic outcome plus better functional recovery at 1-year follow-up.

Methods

Participants

All demographic variables like age, sex, BMI, radiological changes are collected.

Forty patients (26 males and 14 females) affected by symptomatic radiologically confirmed knee osteoarthritis (Kellgren-Lawrence grade II-III) were enrolled in this randomized study. The patient's inclusion criteria were over 45 years of age, chronic pain history, swelling, and/or reduced range of motion in the knee joint. Clinical and radiological confirmation of knee's

OA (Kellgren-Lawrence grades II-III) were verified by X-ray images in anteroposterior and lateral projections. The patient's exclusion criteria were very severe osteoarthritis knee post-traumatic knee osteoarthritis, pregnancy, breastfeeding, oncological diseases, endocrine diseases (gout, diabetes), autoimmune diseases (rheumatoid arthritis), acute/chronic infectious disease, blood clotting disorders (thrombocytopenia, coagulopathy), previous interventions on the knee joint within 10 days prior to the intervention).

Study design, randomization, and intervention

This study was a single-center, randomized controlled trial that investigated treatments for knee pain. Patients with knee pain underwent initial screening to determine eligibility. Those who provided informed consent and met specific criteria were randomly assigned to one of two groups in a 1:1 ratio using a computer-generated list. Participants in Group 1 received a single intra-articular injection of platelet-rich plasma (PRP), while those in Group 2 received a single intra-articular injection of corticosteroid (CS). The pain and function of the target knee were evaluated by VAS scales and Knee Society Scoring at the baseline, 1 week, 1 month, 3 months, 6 months and 1 year after treatment.

Procedure

Patients were randomly assigned to two treatment groups. Patients randomized in the PRP group (n=20)

received an intra-articular injections of PRP(8 mL), while patients allotted in the CS group(n=20) received an intra-articular injection of triamcinolone acetonide (1 mL of 40mg/mL) with Lidocaine(5mL Of 2%) . A blinded evaluator conducted all baseline and follow-up assessments.

Injections were administered under sterile conditions, without anesthesia, using a 20G x 2.75 70mm needle via an anterolateral approach. Ultrasound guidance (Philips Affinity 70) ensured accurate needle placement. Post-injection, patients received an aseptic dressing.

To minimize potential bias, patients avoided non-steroidal anti-inflammatory drugs (NSAIDs) for 10 days post-injection and resumed normal daily activities without specific treatments or restrictions during the follow-up period.

Result

A total of 40 patients were screened. The mean age of the intention-to-treat patients was 61.5 years and 62.05 years for the PRP and CS group, respectively. Participants were 55% men and 45% women for the PRP group and 75% and 25% for the CS group, respectively. There were no significant differences between the 2 groups across all the baseline parameters (age, sex, and K-L grade for OA). Both PRP and CS single injections were effective in reducing pain, and they improved the knee function after the first week of treatment. VAS score changes at 1 year (primary clinical outcome) showed a higher mean change from baseline in the PRP group than the CS group (PRP -2.9 ± 2.0 , -49% ; CS -0.9 ± 1.8 , -16%). This difference was significant between groups ($p = 0.0002$). The most surprising effect observed was that PRP induced pain relief just as fast as CS. In fact, a significant reduction of pain from baseline for both groups was found 1 week after treatment (mean

VAS change— PRP – 2.7 ± 2.3 , – 52%; CS – 2.575 ± 1.5 , – 46%; $p < 0.0001$). The highest change in the VAS score from the baseline was at 3 months for the PRP group (mean – 4.2 ± 1.7 ; – 70%) and at 1 month in the CS group ($- 3.5 \pm 1.2$; – 58%). The pharmacological effect of CS seemed to disappear 4 months after receiving treatment as all scores tended to worsen after this period. For instance, pain in the CS group improved rapidly but, in general, worsened after 4 months of treatment, and the pain steadily increased in each follow-up visit. At the same time, the PRP group resulted in a sustained improvement in pain relief up to 30 weeks, showing a small increase in pain in the 1-year evaluation follow-up.

For the Functional outcome the pre operative and post operative at 1 week , 1 month ,3 month, 6 month and 1 year Knee Society Scoring were calculated .The preoperative mean knee society score for PRP group was 57.8 ± 7.1 and for corticosteroid group was 53.2 ± 8.4 . There was significant improvement in the Knee Society Scoring post one week after the intra articular injection with a value of 82 ± 12.24 for the PRP group and 84 ± 10.2 for the corticosteroid group. At 15 weeks there was significant improvement of 88 ± 9.5 of new society scoring for the PRP group and 73 ± 13.04 for the corticosteroid group. And at 6 months for the PRP group there was a significant improvement of knee society scoring with score of 86 ± 12 but for corticosteroid group there was a significant reduction in the knee society scoring at 6 months with a score of 71 ± 13.5 as compared to the post procedure one week score of 84 ± 10.2 . For the PRP group the Knee society scoring after procedure at one year duration was 77 ± 11.5 but for the corticosteroid group there was a significant decrease in knee society scoring with a score of 60 ± 13.5 post

procedure at one year. From the study it was evident that there was significant improvement in the functional outcome as there was significant improvement in the knee society scoring after PRP intra articular injection as compared to knee society score and the functional outcome after intra articular steroid injection.

Discussion

Corticosteroids (CSs) and platelet-rich plasma (PRP) are widely used treatment options for osteoarthritis (OA), considered safe and effective for knee OA treatment. However, despite some studies indicating PRP's superiority over CSs [18-21], it is unclear whether PRP is the best option.

Recent systematic reviews and meta-analyses provide insights into PRP's efficacy. Costa et al. [18] conducted a systematic review and meta-analysis of 40 randomized controlled trials (RCTs), finding PRP to be as effective as other therapies in pain, function, and stiffness, and more effective in some studies at 6 months follow-up. Anil et al. [19] performed a network meta-analysis of 79 RCTs, identifying PRP as the treatment with the highest P-score at 6 months post-injection for WOMAC score (P-score= 0.7676), outperforming CSs and hyaluronic acid (HA). Similarly, Singh et al. [20] demonstrated that all injectable agents, including PRP, resulted in statistically significant improvements in outcomes compared to placebo. Notably, McLarnon et al. [21] conducted a systematic review and meta-analysis of eight studies, showing PRP to be significantly better than CS injections in reducing OA symptoms (pain, stiffness, functionality) at 3, 6, and 9 months post-intervention ($P < 0.01$). However, the American College of Rheumatology strongly recommends weight loss and exercise as non-pharmacological treatments for knee OA, and oral and topical nonsteroidal anti-inflammatory

drugs and IA glucocorticoid injections are strongly recommended, whereas there is no recommendation regarding PRP injections^[22].

Currently, five injectable CSs are approved by the Food and Drug Administration for IA injections, including methylprednisolone acetate, triamcinolone acetate, betamethasone acetate, and betamethasone sodium phosphate, triamcinolone hexacetonide, and dexamethasone. Research comparing results after different IA CS injections has yielded indecisive results, suggesting each compound has similar potency when used for the correct indication, dosage, timing, and application. The variability in PRP systems, including collection volumes and preparation protocols, reflects a lack of consistency among trials. Furthermore, cell membrane receptors are limited, implying that high concentrations of growth factors may have no beneficial effect on cell stimulatory processes. Additionally, the limited biological half-life of many growth factors in PRP may explain, at least in part, the variance seen with PRP treatment.

Overall, while PRP shows promise, further research is necessary to standardize PRP systems and protocols, understand growth factor biological half-life and optimal concentrations, and confirm PRP's efficacy through high-quality, large-scale trials.

Conclusion

This study demonstrates the safety and efficacy of a single intra-articular platelet-rich plasma (PRP) injection in patients with mild to moderate knee osteoarthritis (OA). PRP significantly reduces pain and improves knee function, with short-term outcomes comparable to corticosteroids. Notably, PRP treatment sustains its beneficial effects for up to 12 months, outlasting

triamcinolone. These findings suggest PRP as a promising treatment for OA.

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