

Short term results of platelet rich plasma in early stages of osteoarthritis knee

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Abstract

Introduction: Osteoarthritis of knee is a most common form of arthritis spread rampantly today. Platelet-rich plasma injections enhance cartilage repair and relieve osteoarthritis Symptoms. Thus it delays the need for joint replacement.

Objective: To investigate the effect of platelet-rich plasma (PRP) on progression of early stages of osteoarthritis knee.

Methodology: A case series study of 50 patients was carried out. Results were analyzed on the basis of following scores:

- WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index)
- KSS (Knee Society Score)
- VAS (Visual Analogue Scale)

Results: There were no significant adverse event observed. Statistically significant results in the Western Ontario and McMaster Universities Osteoarthritis Index and KSS and VAS scorings were recorded in patients who received PRP injections after a 3 and 6 months follow up.

Conclusions: Our study suggests that autologous PRP can be used as an effective and safe method in the treatment of the early stages of osteoarthritis. But further studies are needed to confirm these finding and to investigate the long term effects of autologous PRP.

Keywords: Autologous PRP, Osteoarthritis knee.

Introduction

Osteoarthritis of knee is a most common form of arthritis causing degeneration of articular cartilage and subchondral bone. PRP was first developed in the 1970s and first used in Italy in 1987 in an open heart surgery procedure. PRP therapy began gaining popularity in the mid-1990s. It has since been applied to many different medical fields such as cosmetic surgery, dentistry, sports medicine and pain management. It is a simple, low-cost and minimally invasive method that provides concentrate of autologous growth factors (GFs) that are beneficial to enhance tissue regeneration. Platelet-rich plasma injections aim to promote cartilage repair and relieve osteoarthritic symptoms, potentially delaying the need for joint replacement surgery. Platelets are producers of growth factors that stimulate chondrocyte proliferation, required for cartilage repair. The efficacy of certain growth factors in healing various injuries and the concentrations of these growth factors found within PRP are the theoretical basis for the use of PRP in tissue repair.^[1] The platelets collected in PRP are activated by the addition of thrombin and calcium chloride, which induces the release of the mentioned factors from alpha granules. Human chondrocytes exposed to platelet-rich plasma demonstrated less interleukin-1 β inhibition of collagen 2 gene expression, and decreased nuclear factor-B activation, which are pathways of osteoarthritis pathogenesis.

Aims and Objectives

To check the effectiveness of intra-articular PRP injections in patients with early OA knee and to evaluate clinical outcomes in patients with cartilage lesions.

Materials and Methods

Inclusion criteria

- 40-60 years of age.
- Early stages of Kellgren grade 1-2 of osteoarthritis knee.

Exclusion Criteria

- Patients who have received any intraarticular therapies.
- Have undergone any previous surgical intervention for cartilage regeneration.
- Patients having rheumatoid arthritis.

Fifty patients with knee OA were followed for a minimum of 6 months. All were treated with 3 doses of intra-articular injections of autologous PRP. All the patients received a 6-mL platelet-rich plasma injection using every week. Multiple evaluative scores were collected at pretreatment and at 6 months posttreatment. The required sample of patients was determined beforehand by using statistical power analysis.

Methods

Clinically, patients were assessed for severity of pain, deformity, range of motion at knee joint, activity level and functional capabilities preoperatively. Various scores including KSS, WOMAC score and VAS score. Along with radiological assessment in form of AP, lateral x-rays were used for the assessment.

Observations and Results

No severe adverse events were observed. Statistically significantly better results in the Western

Ontario and McMaster Universities Osteoarthritis Index and VAS scores were noted in patients who received PRP injections after a 3 and 6 months of follow-up. They showed many improvements including reduced pain after knee movement and at rest. Cartilage assessment was limited because of the small sample size. The majority of the patients noted improvement at 6 months follow-up.

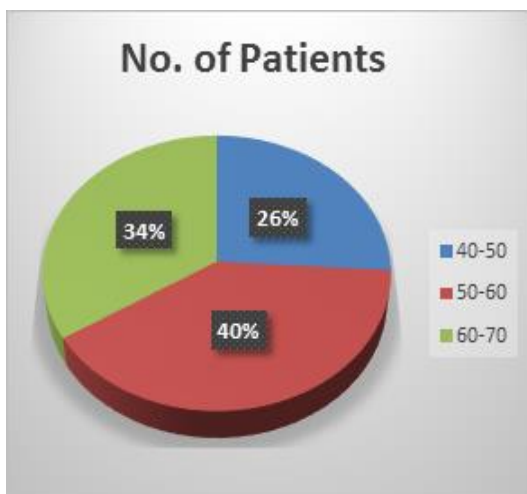


Fig. 1: Age Distribution

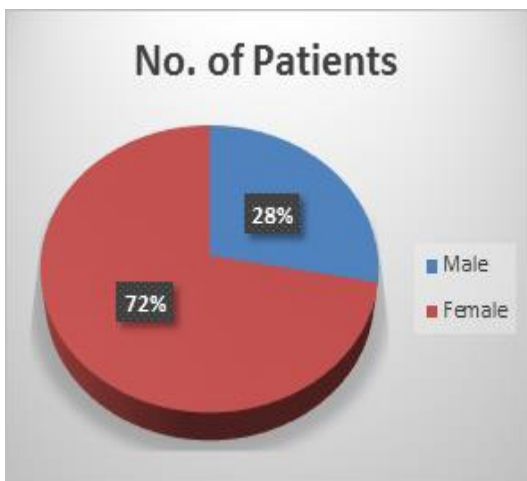


Fig. 2: Sex Distribution

Knee Society Score: In 1989, The Knee Society Score was developed to rate both the knee prosthesis function and patients' functional abilities after total knee arthroplasty. The system is divided into a knee score that rates only the knee joint itself and a functional score that rates the patient's ability to walk and climb stairs. The Knee Society proposed that this new rating system is simple but more exacting and more objective. The rating is divided into knee and patient function scores. Advanced age or a medical condition will not affect the knee score.

Knee society functional scores were improved from 36.4 to 55.10 at 3 months and 59.1. At 6 months of follow up:

| Score | 0(months) | 3(months) | 6(months) |
|-------|-----------|-----------|-----------|
| <50 | 40 | 12 | 11 |
| 50-65 | 8 | 35 | 36 |
| >65 | 2 | 3 | 3 |

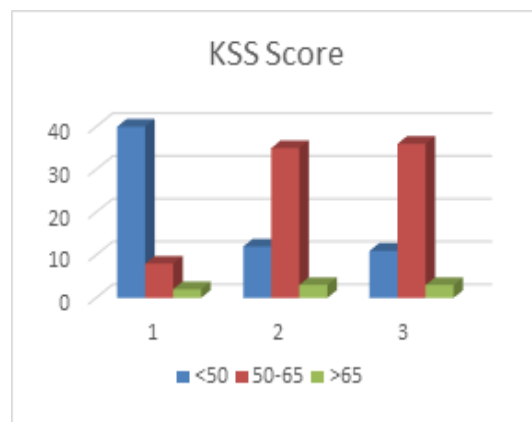


Fig. 3: Showing KSS Score at 3 and 6 months

Womac Score: The WOMAC is one of the most widely used measures of lower extremity function. It is used to assess pain, stiffness, and physical function in patients with hip and/or knee osteoarthritis. The WOMAC score consists of 24 items divided into 3 scales: - pain, stiffness and physical function the mean WOMAC scores were 10.18, 3.12, 36.56, and 49.86, respectively, and at follow-up after 3 months were 5.00, 2.10, 20.08, and 27.18, and after 6 months were 4.50, 2.09, 18.50 and 25.09 respectively, showing significant improvement.

| Score | 0(months) | 3(months) | 6(months) |
|-------|-----------|-----------|-----------|
| <30 | 3 | 38 | 39 |
| 30-50 | 36 | 6 | 8 |
| >50 | 11 | 6 | 3 |

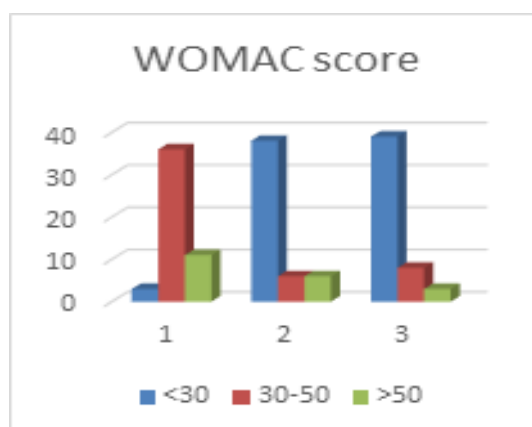


Fig. 4: Showing WOMAC score at 3 and 6 months follow up

Vas Score: The visual analogue scale (VAS) is a psychometric response scale. It is an instrument for subjective characteristics or attitudes that cannot be measured directly. When responding to a VAS questionnaire, respondents inform their level of agreement to a statement by indicating a position along a continuous line between two end-points.

Patients showed improvement from mean score of 7 to 5.5 and 4.9 at 3 months and 6 months of follow up respectively.

| VAS Score | | | |
|-----------|--------|----|----|
| | Months | | |
| | 0 | 3 | 6 |
| 0--3 | 8 | 4 | 4 |
| 3--6 | 12 | 38 | 40 |
| 6--10 | 30 | 8 | 6 |

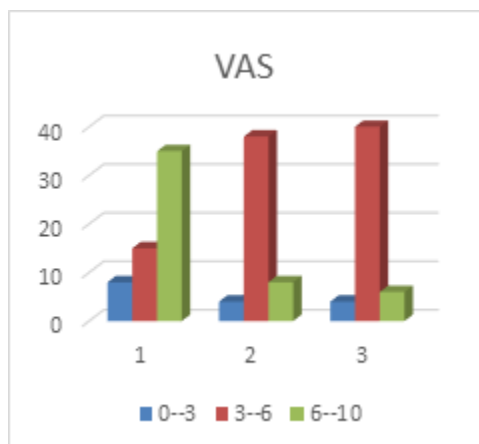


Fig. 5: VAS at 3 and 6 months of follow up

Discussion

The mean age of patients in our study was 59.15. The disease process was found to be more common in females and age group of 50-60.

PRP has been used in surgeries to promote cell regeneration since 1987. Although blood is liquid (called plasma), it contains solid components (RBC, WBC, and platelets). Platelets play an important role in clotting blood. However, platelets also contain hundreds of proteins-growth factors which take part in the healing of injuries.

PRP is plasma with more platelets than what is usually seen in blood. The concentration of platelets and tration of growth factors can be 5 to 10 times higher than usual. To develop autologous PRP, blood first needs to be drawn from the patient. The platelets are separated and their concentration is increased by centrifugation. Then this increased concentration of platelets is combined with the remaining blood. Two spins are performed to

remove RBC's and WBC's from the sample. The upper portion of the volume consists mostly of PPP (platelet-poor plasma) and is removed. Pellets are homogenized in lower 3rd portion to create the PRP (Platelet-Rich Plasma).

Spakova et al Study Results: On average, a 4.5-fold increase in platelet concentration was obtained in the PRP group. No severe adverse events were observed. Statistically significant better results in the Western Ontario and McMaster Universities Osteoarthritis Index and Numeric Rating Scale scores were recorded in patients who received PRP injections after a 3 and 6 month follow-up.

Elizvato et al studies: Only minor adverse events were detected, such as mild pain and effusion after the injections, in particular in the PRP group, where a significantly higher post-injective pain reaction was observed ($p=0.039$). At the follow-up evaluations, both groups presented a clinical improvement but the comparison between the two groups showed statistically significant difference in all scores evaluated. But this trend favorable for the PRP group was only found in patients with low grade articular degeneration (Kellgren-Lawrencscore up to 2).

All studies included in this assessment reported short-term improvements in function and a decrease in pain scores; however this effect did not appear to be sustained over a long period of time. The procedure appears to be safe, with the only adverse event reported being short-term pain following injection due to inflammation.

Conclusion

Our preliminary findings support the application of autologous PRP as an effective and safe method in the treatment of the initial stages of knee osteoarthritis. Further studies are needed to confirm these results and to investigate the persistence of the beneficial effects observed. Better results were noted in younger and more active patients with a lower degree of cartilage degeneration.

Although there is some evidence that PRP injections provide some symptomatic relief, there is no evidence that PRP injections alters the natural progression of OA. Randomized controlled trials using a comparator are needed to demonstrate the effectiveness of PRP treatment of OA of the knee.

References

1. Campbell's Operative Orthopaedics, 12th edition.
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