

Intra-articular Platelet-Rich Plasma Injections for Treating Knee Pain Associated with Articular Cartilage and Degenerative Meniscal Lesions

Konstantin Mitev^{1,2}, Aleksandar Longurov^{2*}

¹Zan Mitrev Clinic for Surgical Disease, Skopje, Republic of Macedonia; ²University Goce Delchev, Faculty of Medical Sciences, Shtip, Republic of Macedonia

Abstract

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***Correspondence:** Aleksandar Longurov, University Goce Delchev, Faculty of Medical Sciences, Shtip, Republic of Macedonia. E-mail: longurov@gmail.com

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BACKGROUND: Platelet-rich plasma (PRP) is an autologous concentration of platelets that contain a large number of growth factors. These growth factors play a role in the regeneration, repair, and acceleration of the biochemical process, thereby reducing the pain associated with injuries of the articular cartilage and meniscus

AIM: The purpose of this study is to evaluate the effect of the PRP method in the treatment of knee joint cartilage injuries and degenerative meniscus lesions as well as pain relief.

MATERIAL AND METHODS: The process of obtaining PRP begins by taking 15 ml of blood from the patient with a special system called Arthrex Double Syringe system. The test tube is centrifuged at 4000 rpm for 5 minutes. From the separated plasma, 5-6 ml PRP is taken and prepared for application. PRP is administered intra-articularly.

RESULTS: At the Jan Mitrev Clinic in Skopje in 2018, PRP procedures were performed on 126 patients, 56 (44.4%) of whom were male, and 70 (55.6%) were female. The patients were evaluated by the Tegner Lysholm Knee Scoring Scale (TLKSS) before applying 3 doses of PRP for 7 days as well as 3 and 6 months after the application of PRP. The results showed considerable improvement 3 months after the PRP application, and 6 months after the application the results remained approximately identical.

CONCLUSION: The application of PRP in the field of medicine is widely applied, and it will continue to be because the understanding of PRP therapy is increasingly refined. This therapy represents a potential and latest method in short-term pain reduction, but additional studies are needed to prove its long-term effectiveness.

Introduction

The most recent research and findings in the treatment of knee pain in articular cartilage injuries and degenerative meniscus lesions are increasing the need for biology and its association with the inflammatory process. The normal function and preservation of articular cartilage and meniscus morphology depend primarily on the balance between aggressive and protective factors [1]. Biology and its use are extremely important for the balance between these factors [2], [3], [4]. Platelet-rich plasma (PRP) is increasingly used in articular cartilage injuries and

degenerative meniscus lesions. PRP is an autologous concentration of platelets that contain a large number of growth factors [5], [6], [7], [8]. These growth factors play a role in the regeneration, repair, and acceleration of biochemical processes, thereby reducing the pain associated with injuries of the articular cartilage and meniscus [9]. The latest world research shows excellent results in reducing pain by using PRP [10], [11], [12], [13], [14]. In the Republic of Macedonia, the PRP application has been used for the last decade.

The purpose of this study is to evaluate the effect of the PRP method in the treatment of knee joint

cartilage injuries and degenerative meniscus lesions as well as pain relief.

Material and Methods

A prospective six-month study involved 15 patients treated at the Zan Mitrev Clinic in Skopje in 2018. All patients underwent a clinical examination, X-ray examinations and magnetic resonance imaging of the knee. They all received 3 doses of PRP applied over 7 days.



Figure 1: Taking 15 ml blood sample

The process of obtaining PRP begins by taking 15 ml of blood from the patient (Figure 1) with a special system called Arthrex Double Syringe system (Figure 2).



Figure 2: Arthrex Double Syringe System

The test tube is centrifuged at 4000 rpm for 5 minutes (Figure 3).



Figure 3: Centrifuge at 4000 rpm

From the separated plasma, 5-6 ml PRP is taken and prepared for application (Figure 4). PRP is administered intra-articularly (Figure 5). The Tegner Lysholm Knee Scoring Scale was used for evaluating the patients at the first and sixth month after the treatment with PRP.

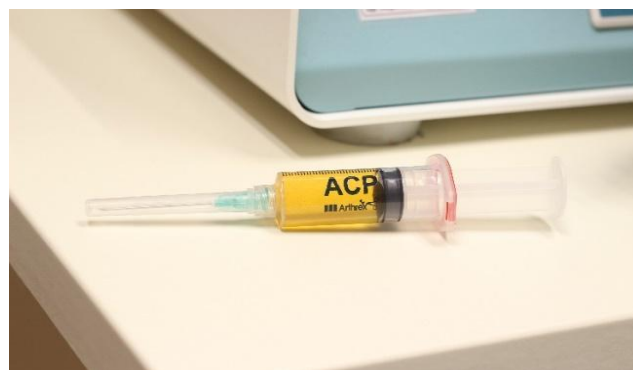


Figure 4: PRP ready for application

All patients included in the study signed a consent to participate in the study, as well as consent for publishing the results.



Figure 5: Intra-articular application of PRP

Statistical method

The statistical series, according to the defined variables of interest, are tabulated and graphically presented. The distribution of the numerical statistical series (correct/incorrect) was tested with Kolmogorov Smirnov test, Lilliefors test and Shapiro-Wilk's W test. The numerical series structure was analysed with the central tendency (mean) and dispersion measures (standard deviation). The significance test of the difference between two arithmetic means in the independent samples was performed with the parametric Student-t-test. The significance test of the difference between the two-arithmetic means in the dependent samples was performed with the nonparametric Wilcoxon matched-pairs test.

Testing the significance of the differences between the three arithmetic meanings in the dependent samples was performed with Friedman ANOVA, the significance level for $p < 0.05$ at $CI = 95\%$ is considered statistically significant. The database is analysed with the statistical program STATISTICA 12 for Windows.

Results

At the Zan Mitrev Clinic in Skopje in 2018, PRP procedures were performed on 126 patients, 56 (44.4%) of whom were male, and 70 (55.6%) were female. From the 126 patients, 15 were examined and evaluated in this study, 10 of them (66.7%) were female, and 5 (33.3%) were male. The average age of the total number of respondents was 49.3 ± 6.3 years.

Table 1: Mean Age Value of Examined Patients by Sex

Sex	Mean	Std. Dev.	Min	Max
Females	49.1	5.8	38	60
Males	49.8	7.8	36	55
Total	49.3	6.3	36	60

The average age of the female respondents was 49.1 ± 5.8 , and for males, it was 49.8 ± 7.8 years. There was no significant difference in age between the subjects of both sexes (There was no significant difference in age between the subjects of both sexes (Student-t-test: $t = -0.196$, $p = 0.8475$) (Table 1 and Figure 6).

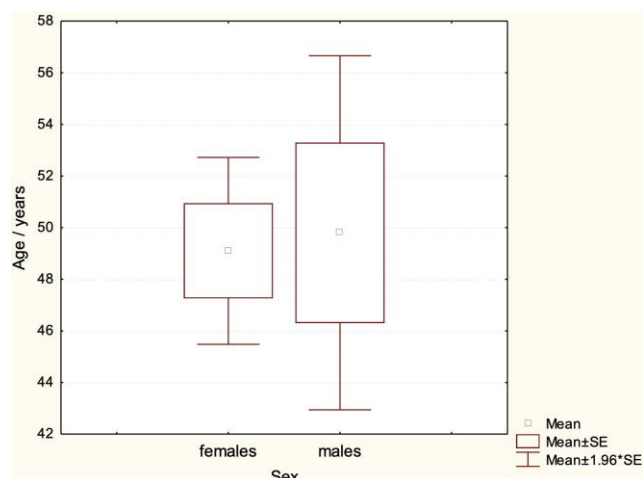


Figure 6: Mean Age Value of Examined Patients by Sex

The patients were evaluated by the TLKSS (Tegner Lysholm Knee Scoring Scale) before applying 3 doses of PRP for 7 days as well as 3 and 6 months after the application of PRP. The results showed considerable improvement 3 months after the PRP application, and 6 months after the application the results remained approximately identical.

The mean value of TLKSS before the intervention was 61.9 ± 7.4 after 3 months, and after 6 months, it was 83.4 ± 4.6 and 83.4 ± 4.3 , respectively. The variance analysis showed that there were statistically significant differences concerning the TLKSS at the three points of time (Friedman ANOVA: Chi. Sqr. = 24.54, $p = 0.00001$). There also was a statistically significant difference between the mean values of TLKSS before the intervention and after 3 months (Wilcoxon matched-pairs test: $Z = 3.407$, $p = 0.00062$). There was also a statistically significant

difference between the mean values of TLKSS before the intervention and 6 months after (Wilcoxon matched-pairs test: $Z = 3.411$, $p = 0.00065$).

Table 2: Mean Value on the TLKSS at different points in time

Tegner lysholm knee scoring scale	Mean	Std.dev.	Min	Max
Before intervention	61.9	7.4	51	74
After 3 months	83.5	4.6	77	92
After 6 months	83.4	4.3	75	90

The difference between the mean values of TLKSS after 3 and 6 months was insignificant (Wilcoxon matched-pairs test: $Z = 3.411$, $p = 0.00065$) (Table 2 and Figure 7).

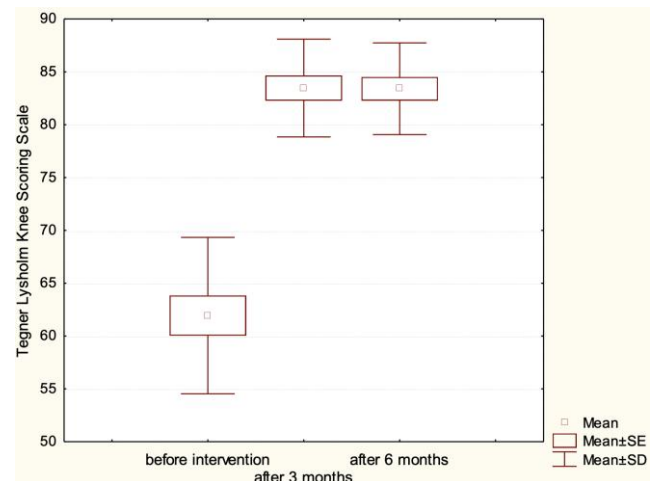


Figure 7: Mean Value on the TLKSS at different points in time

Discussion

The main purpose of PRP is to restore the balance between protective and aggressive factors through anti-inflammatory effects. Abrams et al., [15] state that the PRP therapy for patients that have osteoarthritis shows positive results in both clinical and pre-clinical trials. In their paper, these authors pointed out several limits in their research because of the selective selection of patients. In their research on the quality of PRP therapy in degenerative joint cartilage degeneration, Campbell et al., [16] indicated that the International Knee Documentation Committee (IKDS) achieved a six-month improvement. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), showed significant improvement compared to hyaluronic acid (HA) when it comes to pain in 3- and 6-month follow-ups. A large number of scientific studies have shown positive short-term results in the use of PRP treatment, while a relatively small number of studies have demonstrated a long-term efficacy [17]. The demographic data of patients such as body mass index, age and sex, play a role in the effectiveness of PRP [18], [19], [20]. Several studies have failed to confirm the use of medications after the PRP treatment, while some

studies have evaluated the effect of drugs on the effectiveness of PRP [21].

In conclusion, the application of PRP in the field of medicine is widely applied, and it will continue to be because the understanding of PRP therapy is increasingly refined. This study shows the effect of PRP in 15 patients, with a significant reduction in pain, following the administration of 2-3 doses of PRP evaluated on the TLKSS. Also, no side effects were observed in any of the patients that were studied. This therapy represents a potential and latest method in short-term pain reduction, but additional studies are needed to prove its long-term effectiveness.

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