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EFFECTS OF PLATELET-RICH PLASMA AND OZONE THERAPY ON PAIN AND QUALITY OF LIFE IN KNEE OSTEOARTHRITIS: A RETROSPECTIVE TRIAL

DİZ OSTEOARTRİTİNDE TROMBOSİTTEN ZENGİN PLAZMA VE OZON TEDAVİSİNİN AĞRI VE YAŞAM KALİTESİ ÜZERİNE ETKİLERİ: RETROSPEKTİF ÇALIŞMA

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ABSTRACT

Objective: There are many methods for treating knee osteoarthritis (KOA). However, especially among conservative treatments, intra-articular injection methods have not been shown to be superior to each other. In our study, we compared the effects of ozone therapy and platelet-rich plasma on pain and functionality.

Material and Methods: This retrospective clinical study included patients aged 30-70 years who received ozone and Platelet-Rich Plasma (PRP) for the treatment of knee osteoarthritis. Both groups received three sessions of ultrasound-guided intra-articular injection. The demographic characteristics of the patients, such as age and gender, were recorded. Pain was assessed with a numerical rating scale (NRS) before and three months after treatment, functionality with the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and quality of life with the Short Form-12 (SF-12).

Results: The mean age of the 54 patients included in the study was 58.53±8.25 years. No significant difference was found between the two groups in terms of age, gender, pre-treatment NRS, WOMAC, and SF-12 values. There were significant differences in the NRS, WOMAC, and SF-12 values in both ozone and PRP groups after treatment compared to before treatment. However, this difference was not found to be significant between the groups.

Conclusion: Both PRP and ozone therapy are effective short-term treatments for KOA. There is no evidence that one is more effective than the other.

Keywords: Knee osteoarthritis, ozone, pain, platelet-rich plasma,

ÖZET

Amaç: Diz osteoartritinin (DOA) tedavisi için birçok yöntem vardır. Ancak özellikle konservatif tedaviler arasında eklem içi enjeksiyon yöntemlerinin birbirlerine üstünlüğü gösterilememiştir. Çalışmamızda, ozon tedavisi ve trombositten zengin plazmanın ağrı ve fonksiyonellik üzerindeki etkilerini karşılaştırmayı amaçladık.

Gereç ve Yöntem: Bu retrospektif klinik çalışmaya diz osteoartriti tedavisi için ozon ve trombositten zengin plazma (PRP) alan 30-70 yaş arası hastalar dahil edildi. Her iki gruba da üç seans ultrason eşliğinde eklem içi enjeksiyon uygulandı. Hastaların yaş ve cinsiyet gibi demografik özellikleri kaydedildi. Ağrı tedaviden önce ve üç ay sonra sayısal derecelendirme ölçeği (NRS) ile, işlevsellik Western Ontario ve McMaster Üniversiteleri Osteoartrit İndeksi (WOMAC) ile ve yaşam kalitesi Kısa Form-12 (SF-12) ile değerlendirildi.

Bulgular: Çalışmaya dahil edilen 54 hastanın yaş ortalaması 58,53±8,25 yıl idi. İki grup arasında yaş, cinsiyet, tedavi öncesi NRS, WOMAC ve SF-12 değerleri açısından anlamlı bir fark bulunmadı. Hem ozon hem de PRP gruplarında tedavi sonrası NRS, WOMAC ve SF-12 değerlerinde tedavi öncesine göre anlamlı farklılıklar vardı. Ancak bu fark gruplar arasında anlamlı bulunmamıştır.

Sonuç: Hem PRP hem de ozon tedavisi DOA için etkili kısa süreli tedavilerdir. Birinin diğerinden daha etkili olduğuna dair bir kanıt saptanmamıştır.

Anahtar kelimeler: Diz osteoartriti, ozon, ağrı, trombositten zengin plazma, yaşam kalitesi

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INTRODUCTION

Knee osteoarthritis (KOA) is a common degenerative joint disorder that leads to chronic pain and reduced function, particularly in older populations (1). With an estimated prevalence of 3.8%, KOA affects over 300 million people globally, a number expected to rise due to increased life expectancy and obesity rates (2-4).

Treatment approaches for KOA fall into two broad categories: conservative and surgical. Surgery offers a definitive solution but is typically reserved as a last resort due to its cost and higher risk of complications (5, 6). Among the conservative methods, intra-articular injections have gained attention although current research does not establish any one injection as superior. While many studies have focused on individual injectate, few have compared different types, such as ozone, platelet-rich plasma (PRP), corticosteroids, and hyaluronic acid. This gap often leaves clinicians to make treatment decisions based on experience rather than high-level evidence (7). This is because the study methods employed have often focused on the effect of a single injectate. The number of studies examining the comparative efficacy of intra-articular injection types, including ozone, PRP, corticosteroid, and hyaluronic acid, in terms of pain and functional status is limited (5). This lack of evidence-based research results in clinicians organising treatment plans based on their personal experiences rather than on treatments with a high level of evidence. In response, this study aimed to compare the efficacy of PRP and ozone therapy in managing KOA-related pain and functional impairment.

MATERIAL AND METHODS

This retrospective comparative study was conducted between August and September 2024 at the Physical Medicine and Rehabilitation Clinic of Şişli Hamidiye Etfal Training and Research Hospital. Ethical approval was granted by the Clinical Research Ethics Committee of Şişli Hamidiye Etfal Training and Research Hospital (Date: 09.07.2024, No: 2691), and all participants provided informed consent.

The initial screening phase involved the evaluation of 72 patients, aged between 30-70 years, who had presented at the outpatient clinic for the purpose of receiving treatment for KOA and had been administered an intra-articular injection as part of a PRP or ozone therapy between January and April 2024. Only patients diagnosed with stage 2 or 3 KOA, according to the Kellgren-Lawrence grading system. Patients with KOA flares, stages 1 or 4 osteoarthritis, recent knee surgery or injections within the last three months, infections, malignancies, bleeding disorders, or cognitive impairments were excluded.

Demographic and clinical data, including age, gender, occupation, gonarthrosis stage, and symptom duration, were collected through hospital records. Pain levels were recorded using the Numeric Rating Scale (NRS), functionality was assessed via the WOMAC index, and quality of life was evaluated using the Short Form-12 (SF-12) before treatment and three months afterward. Patients were divided into two groups: one receiving intra-articular leukocyte-poor PRP and the other ozone therapy. Each group received three weekly injections administered under ultrasound guidance. The ozone group was given 15 µg/mL of ozone, delivered in 10 cc volumes, while PRP was prepared using a two-step centrifugation process. In the PRP group, blood was drawn from the patients, placed in citrated tubes, and spun at low speed to separate platelets. After the first centrifugation, the plasma containing the platelets was transferred to new tubes and subjected to higher-speed centrifugation, after which the platelet-rich fraction was injected into the knee under ultrasound guidance, with the knee flexed at 20°.

Statistical analysis

Sample size calculations, with an alpha significance level of 0.05 and 95% power, indicated that at least 54 participants were required. Descriptive statistics included means, standard deviations, medians, minimums, maximums, frequencies, and percentages. The Kolmogorov-Smirnov test was used to assess the data distribution. The Mann–Whitney U test was applied to the independent quantitative variables, and the Wilcoxon and Student-t tests were used for the dependent data. The chi-square test and Fisher's exact test were used to analyse qualitative data when the chi-square assumptions were unmet.

RESULTS

Of the 72 patients screened, 27 patients who met the inclusion criteria were included in the PRP group, and 27 patients were included in the ozone group. Of the 18 patients excluded from the study, 12 had undergone ozone therapy and 6 had received PRP. The retrospective data study revealed that no adverse effects were reported following the injection.

The average age of participants was 58.53±8.25 years. The ozone group had a mean age of 58.2±8.54, and the PRP group had a mean age of 58.9±8.11. Age differences between the groups were not statistically significant ($p>0.05$). In terms of gender, 49 patients (90.7%) were female and 5 (9.3%) were male, with no significant difference in gender distribution between the groups ($p>0.05$). Both groups showed no significant pre-treatment differences in NRS scores, WOMAC scores, Kellgren-Lawrence stages, or SF-12 mental and physical component scores ($p>0.05$).

Post-treatment results indicated significant improvements in the ozone group across the NRS, WOMAC, and SF-12 physical and mental component scores ($p<0.05$). Similarly, the PRP group demonstrated signif-

icant improvements in these same measures ($p<0.05$). However, when comparing the magnitude of change in the NRS and WOMAC scores between the groups, no statistically significant differences were identified ($p>0.05$). The only notable difference between the groups was found in the SF-12 mental component scores, where the ozone group saw a significant increase, while the PRP group experienced a decrease, creating a statistically significant divergence between the two groups ($p<0.05$). These findings are summarised in Table 1.

Table 1: Comparison of the ozone and PRP groups in terms of pain, functionality, and quality of life

	Ozone group (n=27) Mean±SD	PRP group (n=27) Mean±SD	p
Pre-treatment NRS for pain	7.52±0.753	7±0.877	
Post-treatment NRS for pain	5.89±1.739	5.22±1.761	
Intra-group changes	mean difference: 2.00	mean difference: 2.00	0.483[M]
Intra-group p	**<.001[W]**	**<.001[W]**	
Pre-treatment WOMAC	53.7±16.134	50.26±6.746	
Post-treatment WOMAC	44.22±15.2	42.15±12.654	
Intra-group changes	mean difference: 9.00	mean difference: 8.41	0.614[M]
Intra-group p	**<.001[W]**	**<.001[W]**	
Pre-treatment SF-12 PCS	33.47±5.722	34.27±6.087	
Post-treatment SF-12 PCS	37.02±7.871	39.35±6.732	
Intra-group changes	mean difference: -3.55	mean difference: -5.46	0.400[T]
Intra-group p	**0.019[P]**	**<.001[W]**	
Pre-treatment SF-12 MCS	48.3±6.719	51.27±7.589	
Post-treatment SF-12 MCS	51.8±6.176	49.89±8.263	
Intra-group changes	mean difference: -3.50	mean difference: 1.31	**0.003[M]**
Intra-group p	**0.018[P]**	**0.011[W]**	

NRS: Numeric Rating Scale, WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index, SF-12: Short Form-12, PCS: Physical Component Score, MCS: Mental Component Score, PRP: Platelet-Rich Plasma SD: Standard deviation, M: Mann–Whitney U Test, T: Student-t Test, P: Paired T test, W: Wilcoxon Test

DISCUSSION

This study highlights that both ozone therapy and PRP are effective in managing pain and improving functional status in patients with KOA over the short term. Our findings indicate significant improvements in pain relief and functionality after treatment in both groups, with no substantial evidence revealing that one therapy is more effective than the other. These results align with existing literature, including a meta-analysis by Rahimzadeh et al., which found both treatments effective in the short term, although PRP demonstrated superior long-term outcomes for KOA (8). Similarly, Raeissadat et al.'s randomised clinical trial also supported our results, indicating that ozone therapy produces rapid relief, with comparable early-stage outcomes to PRP. However, in the later stages, PRP shows a tendency to yield more sustained benefits (3). This distinction is echoed in other research, such as a meta-analysis by Lin et al., where PRP outperformed other intra-articular therapies for treating KOA (5).

In a study examining ozone therapy, Arias-Vazquez et al. observed a marked reduction in pain following intra-articular ozone injections, although the improvements in functionality were temporary (9). Our study also demonstrated significant improvements in pain and function, but as we only evaluated patients over a 3-month period, longer-term assessments are required to fully gauge these effects. In a meta-analysis comparing PRP with corticosteroids, which have proven their effectiveness in the treatment of KOA for years, although intra-articular corticosteroid injection and PRP showed similar effects in terms of pain and functionality in the early period, the superiority of PRP over corticosteroids was shown in the longer term, and this is thought to increase the effectiveness of PRP as a treatment method (10). A study by Khuba et al. demonstrated that PRP is an effective treatment for pain reduction and functional improvement in early KOA, with benefits lasting up to six months after a single dose application (11). The effectiveness of PRP is influenced by numerous factors, such as the patient's initial pain level, the concentration of white blood cells, and the platelet count in the prepared PRP. The researches show that a platelet concentration of at least 10 billion is required to achieve meaningful therapeutic effects in KOA (12, 13). In our study, PRP was prepared in line with these recommendations, and the ozone doses administered also correspond to those cited in the existing literature (14).

Moreover, some studies have explored the combination of PRP and ozone therapy. For example, Dernek et al. found that combining these therapies resulted in similar improvements in pain and function as PRP alone, although the ozone group reported reduced pain after injections. This supports the idea that PRP is also effective as a monotherapy for KOA (15).

One of the key limitations of this study is its short-term follow-up period. Although our evaluations were performed three months post-treatment, longer-term studies are necessary to understand the sustained effects of both therapies. Additionally, this study was not a randomised controlled trial, and there was no blinding, which could introduce bias. Future studies should address these limitations by employing randomised controlled designs with extended follow-up periods.

CONCLUSION

This study demonstrated that both PRP and ozone therapy are effective short-term treatments for KOA, providing significant improvements in pain and functionality. No clear evidence demonstrates that one treatment is more effective than the other within the evaluated period. However, further long-term studies are needed to assess whether the benefits of these therapies persist over time.

Ethics Committee Approval: Ethics committee approval was received for this study from the Şişli Hamidiye Etfal Training and Research Hospital (Date: 09.07.2024, No: 2691).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

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