



Functionality and quality of life of patients with knee osteoarthritis after platelet-rich therapy

Funcionalidade e qualidade de vida de pacientes com osteoartrite do joelho após terapia rica em plaquetas

Funcionalidad y calidad de vida de pacientes con artrosis de rodilla tras terapia rica en plaquetas

Cristiane de Oliveira Riedo¹, Makcilene Paranho de Souza¹, Wagner Salvarani¹, Aroldo Gavioli², Fernanda Ferreira Evangelista¹, Nelson Luiz Batista de Oliveira³, Sandra Marisa Pelloso⁴, Mariá Ramanio Bitencourt⁵, Paulo Acácio Egger¹, Maria Dalva de Barros Carvalho⁴.

ABSTRACT

Objective: To evaluate the functional capacity and quality of life of patients with knee osteoarthritis submitted to platelet-rich plasma injection. **Methods:** Observational cross-sectional study carried out with 31 subjects seen at the orthopedics outpatient clinic of a university hospital in a municipality in northwestern Paraná, from 2016 to 2017. For data collection, a sociodemographic questionnaire was used, the Short Form36 and Lequesne's Algofunctional Questionnaire. For data analysis, descriptive statistics were used, with measures of dispersion, interquartile range and non-parametric Wilcoxon test. A 95% confidence level was established, and associations with $p < 0.05$ were considered statistically significant. All analyzes were performed using the R statistical environment. **Results:** Most patients were female, with a mean age of 59.8 years ($SD \pm 12.2$). In the pre-intervention with platelet-rich plasma, all subjects were classified in the extremely severe category. There was a significant improvement in all eight Short Form-36 domains, as well as pain reduction and functional recovery in the 31 patients. **Conclusion:** Platelet-rich therapy through injection in patients with knee osteoarthritis improved quality of life and reduced pain with increased operational capacity.

Keywords: Osteoarthritis, Quality of life, Physical functional performance, Platelet-rich plasma.

RESUMO

Objetivo: Avaliar a capacidade funcional e a qualidade de vida de pacientes com osteoartrite de joelho submetidos à injeção de plasma rico em plaquetas. **Métodos:** Estudo observacional transversal realizado com 31 sujeitos atendidos no ambulatório de ortopedia de um hospital universitário de um município do

¹ University Hospital of Maringá, Health Science Postgraduate Program at State University of Maringá, Maringá - PR.

² University Hospital of Maringá, State University of Maringá, Maringá - PR.

³ Department of Nursing, State University of Maringá. Maringá - PR.

⁴ Postgraduate Program in Health Sciences at the State University of Maringá. Maringá - PR.

⁵ Centro Universitário Unicesumar, Maringá - PR.

norooeste do Paraná, de 2016 a 2017. Para a coleta de dados, foi utilizado um questionário sociodemográfico, o Short Form36 e o Questionário Algofuncional de Lequesne. Para análise dos dados, foram utilizadas estatísticas descritivas, com medidas de dispersão, intervalo interquartil e teste Wilcoxon não paramétrico. Foi estabelecido um nível de confiança de 95%, e as associações com $p < 0,05$ foram consideradas estatisticamente significativas. Todas as análises foram realizadas utilizando o ambiente estatístico R. **Resultados:** A maioria dos pacientes eram do sexo feminino, com idade média de 59,8 anos ($DP \pm 12,2$). Na pré-intervenção com plasma rico em plaquetas, todos os sujeitos foram classificados na categoria extremamente severa. Houve uma melhoria significativa em todos os oito domínios do Form-36 curto, bem como redução da dor e recuperação funcional nos 31 pacientes. **Conclusão:** A terapia rica em plaquetas através de injeção em pacientes com osteoartrite do joelho melhorou a qualidade de vida e reduziu a dor com o aumento da capacidade operacional.

Palavras-chave: Osteoartrose, Qualidade de vida, Desempenho funcional físico, Plasma rico em plaquetas.

RESUMEN

Objetivo: Evaluar la capacidad funcional y la calidad de vida de pacientes con artrosis de rodilla sometidos a inyección de plasma rico en plaquetas. **Métodos:** Estudio observacional transversal realizado con 31 sujetos atendidos en el ambulatorio de ortopedia de un hospital universitario de un municipio del noroeste de Paraná, entre 2016 y 2017. Para la recolección de datos, se utilizó un cuestionario sociodemográfico, el Short Form36 y el Cuestionario Algofuncional de Lequesne. Para el análisis de los datos, se utilizó estadística descriptiva, con medidas de dispersión, rango intercuartil y test no paramétrico de Wilcoxon. Se estableció un nivel de confianza del 95%, y las asociaciones con $p < 0,05$ se consideraron estadísticamente significativas. Todos los análisis se realizaron utilizando el entorno estadístico R. **Resultados:** La mayoría de los pacientes eran mujeres, con una edad media de 59,8 años ($DE \pm 12,2$). En la pre intervención con plasma rico en plaquetas, todos los sujetos se clasificaron en la categoría extremadamente grave. Se produjo una mejoría significativa en los ocho dominios del Short Form-36, así como una reducción del dolor y una recuperación funcional en los 31 pacientes. **Conclusión:** El tratamiento con plasma rico en plaquetas mediante inyección en pacientes con osteoartritis de rodilla mejoró la calidad de vida y redujo el dolor con un aumento de la capacidad operativa.

Palabras clave: Osteoartritis, Calidad de vida, Rendimiento físico funcional, Plasma rico en plaquetas.

INTRODUCTION

Osteoarthritis (OA) is a degenerative process that slowly damages the joints. It causes pain, functional loss, and deformation of the affected areas. It is one of the most prevalent forms of arthritis worldwide, decreasing the quality of life and leading the person to disability in advanced stages, especially in the elderly (DELGADO D, et al., 2019).

With the progressive aging of the population, there was an increase in the prevalence of OA. Brazilian census indicators pointed out that currently, the community over 60 years old is 13%, with a projection of 32% of the total number of Brazilians for the year 2060 (INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA, 2018). In this sense, in 2060, there should be 228 million inhabitants, being more than 70 million over 60 years of age. Such a process of demographic transition and population aging brings with it a significant social, economic, and health burden worldwide, and OA becomes a significant public health problem (MUCHEDZI TA and ROBERTS SB, 2018).

Despite therapeutic options, there are significant losses due to function inability and decrease in quality of life due to the pain caused by this pathology. OA is the second most common cause of loss of performance at work (MUCHEDZI TA and ROBERTS SB, 2018).

A relatively new strategy for the treatment of OA is the use of cellular and biomedical elements with tissue

response. In this context, platelet-rich plasma (PRP) has been configured as a perspective to stimulate the repair of degraded cartilage due mainly to the presence of growth factors that can regulate joint cartilage turnover (KNOP E, et al., 2016; TEY RV, et al., 2022). PRP is a blood product obtained by a low-cost and simple laboratory process characterized by high concentrations of platelets, and relevant sources of growth factors (GF) and proteins in a small volume of plasma. It has the advantage of being an autologous product, that is, organic, non-toxic, and non-immunoreactive (DELGADO D, et al., 2019; POPESCU MN, et al., 2021).

It is known that the effectiveness in the use of PRP is in need to standardize the protocols for obtaining an ideal platelet concentrate. Several studies show promising results. However, some issues still need to be clarified so that the PRP can be used definitively (PAVANI AA e FERNANDES TRL, 2017; POPESCU MN, et al., 2021). Regenerative therapy with PRP has been the subject of numerous studies, such as randomized clinical trials comparing its effects with placebo injections, hyaluronic acid injections, corticosteroid injections and prolotherapy (LI W, et al., 2022; RAHIMZADEH P, et al., 2018; USLU GÜVENDI E, 2019; WU YT, et al., 2018), and in systematic review studies with meta-analysis (COGNASSE F, et al., 2021; LI W et al., 2022; RAMPAL S, et al., 2022).

Several studies have evaluated pain levels, functional capacity and quality of life in patients undergoing PRP therapy using validated instruments such as Short Form-36 (FREIRE MR, et al., 2020; LAGUARDIA J, et al., 2013), Western Ontario and McMaster Universities (WOMAC) (DUIF C, et al., 2015; KON E, et al., 2011), Lequesne Algofunctional Questionnaire (ALMEIDA G et al., 2021; MARX FC, et al., 2006; SHEN L, et al., 2017) and Visual analog scale in the context of clinical trials or experimental study. However, as far as is known, no studies using the SF-36 and Lequesne questionnaires with the specific purpose of identifying the subject's perception of their functional condition and quality of life before and after PRP therapy were found.

Given these considerations, as well as the need to evaluate the effectiveness of intra-articular injection of PRP in improving quality of life, functional capacity and pain reduction in patients with knee OA, the present study aimed to evaluate functional capacity and quality of life of patients with knee OA undergoing treatment with PRP.

METHODS

Recruitment of participants and procedure

Cross-sectional observational study with all patients seen at the Orthopedics Outpatient Clinic of a teaching hospital undergoing treatment for knee OA, with PRP injection between the years 2016 to 2017. The following inclusion criteria were listed: age ≥ 18 years and with cognitive conditions to answer to the research instruments. For data collection, we used an interview script structured in two modules: the first composed of a questionnaire for sociodemographic and clinical characterization and the second composed of the SF-36 instruments (LAGUARDIA J, et al., 2013) and the Lequesne Algofunctional Questionnaire (MARX FC, et al., 2006). The following inclusion criteria were listed: age ≥ 18 years and cognitive ability to respond to research instruments, both sexes, and individuals who reported knee pain diagnosed with knee osteoarthritis.

Preparation of PRP:

Three tubes of the participant's own blood containing sodium citrate were collected and centrifuged at 100g for 15 minutes (1000 rpm) at room temperature (20°C) to obtain plasma. After this step, to obtain PRP, 2 mL of the sedimented fractions close to the whole blood were collected using a syringe with a needle filled with a mixture of 1 mL of calcium gluconate and 1 mL of 2% lidocaine. 1 to 4 PRP applications were performed with an interval of 2 to 6 months between the applications.

All patients received information about the research objectives, and all signed the Informed Consent Form (ICF). The project was approved by the Ethics and Research Committee Involving Humans of the State University of Maringá, opinion number 3.091.415, CAAE: 01581118.7.0000.0104.

The SF-36 has 36 questions and eight subjective domains that assess social aspects, functional capacity, pain, the patient's general health. Its score ranges from zero to 100, in which zero corresponds to the worst

general health status, limitations due to emotional aspects, limitations due to physical aspects, mental health, and vitality (LAGUARDIA J, et al., 2013). The Lequesne Algofunctional Questionnaire is an instrument that assesses symptoms and physical disability. It consists of 11 questions about pain and discomfort. A score result ranging from 1 to 4 corresponds to little impairment of physical capacity, and values equal to or greater than 14 points indicate extremely severe disability (MARX FC, et al., 2006). Algofunctional Assessment Questionnaire was adapted to respond to the objectives of this research. These questionnaires are usually self-applied; however, in the present study, the questionnaires were applied by the researcher by reading the questions to the patients. This adaptation was necessary mainly in the SF-36 instrument, given the subjects' difficulty in reading and also because the evaluation of responses related to the periods before and after treatment with PRP was performed in a single interview. The interviews were recorded on a form and later compiled using Microsoft Excel®.

Statistical analysis

Data analysis was performed using descriptive statistics with measures of dispersion and central tendency, absolute and relative frequencies (MARTINEZ L, 2015). To assess the scores with responses related to the period before and after injection with the PRP, we opted for the paired non-parametric Wilcoxon test, given the non-normality of the scores (AGRESTI A, 2019). Associations with a p-value <0.05 in a 95% confidence interval were considered statistically significant. All analyses were performed using R statistics (R DEVELOPMENT CORE TEAM, 2021).

RESULTS

Throughout the research period, 52 patients with PRP were treated, with a loss of 21: six refused to participate in the research; ten had registration issues or did not respond to the telephone call at the time of the invitation to participate in the research, and five did not have cognitive conditions to answer the questionnaires. A total of 31 patients who met the inclusion criteria were interviewed in this study. Sociodemographic data of the 31 patients who underwent OA treatment with PRP injection are shown in **Table 1**.

Table 1 - Frequency distribution of sociodemographic variables of patients undergoing PRP therapy in Maringá, Paraná, Brazil (2019).

Variable	Level	n (%)
Gender	Female	24 (77.4)
	Male	7 (22.6)
Color	White	21 (67.8)
	Brown	9 (29.0)
	Black	1 (3.2)
Age groups*	24 - 30	1 (3.2)
	31 - 37	1 (3.2)
	38 - 44	1 (3.2)
	45 - 51	4 (13.0)
	52 - 58	3 (9.7)
	58 - 65	13 (42.0)
	66 - 72	4 (12.9)
	73 - 79	2 (6.4)
	80 - 87	2 (6.4)
Municipality of residence	Maringá	24 (77.4)
	Other	7 (22.6)
Occupation	Retired	7 (22.6)
	Nursing technician	5 (16.1)
	Housewife	4 (12.9)
	Housekeeper	3 (9.7)
	Other	12 (38.7)

(*) The average age of the participants was 59.84 years (SD \pm 12.26), median and mode of 62 years, with a minimum of 24 years and a maximum of 84 years. **Source:** Riedo CO, et al., 2023.

Data on the clinical characteristics and the Algofunctional assessment of the pre-injection period of the PRP are shown in **Table 2**.

Table 2 - Frequency distribution of clinical variables and Algofunctional assessment of 31 patients diagnosed with knee OA, in the pre-injection period of the PRP in Maringá, Paraná, Brazil (2019).

Variable	Categories	n (%)
Subjective pain intensity	Mild	0 (0.0)
	Moderate	10 (32.3)
	Severe	21 (67.7)
Duration of pain in Years	0 - 5	24 (77.5)
	6 - 10	5 (16.1)
	11 - 15	1 (3.2)
	16 and +	1 (3.2)
Pain during night rest	Insignificant	3 (9.7)
	To movements or certain positions	6 (19.3)
	Even without movement	22 (71.0)
Morning stiffness or pain that lessens after getting up	1 minute or less	4 (13.0)
	more than 1 minute, but less than 15	6 (19.3)
	More than 15	21 (67.7)
Pain after walking for 30 minutes	No	0 (0.0)
	Yes	31 (100.0)
Pain while walking	None	0 (0.0)
	After some distance	4 (12.9)
	Right after starting and it increases continuously	23 (74.2)
	After starting, however it does not increase	4 (12.9)
Pain when getting up from the chair without the help of arms	No	2 (6.5)
	Yes	29 (93.5)

Source: Riedo CO, et al., 2023.

Regarding the clinical condition of OA-related pain in the knees, patients lived with disabling pain on average for 4 years. Most were in severe pain, even during the night rest, and all felt pain after thirty minutes of activity.

The data from the SF-36 instrument, with evaluation before and after PRP injection in a single interview, are shown in table 3. In the domain of social aspects, it was observed that in the periods before the PRP, the median of the score was 25 with an interquartile range (IIQ) of \pm 68.75.

In the post-PRP period, the median SF-36 score was 100 (IIQ \pm 12.50), with statistical significance in the Wilcoxon paired test with a p-value $<$ 0.001. In the quantitative evaluation of the SF-36 score, it was observed

that in the pre-PRP period most patients were at the level of 0 to 20% of the score (n=12; 38.7%) and in the post-PRP period, the majority (n=24; 77.4%) had a score ranging from 81 to 100%.

Table 3 - Result of the Wilcoxon paired test in the eight domains of the SF-36 questionnaire in the pre- and post-intra-articular injection period with PRP and frequency distribution of the score level of thirty-one patients, in Maringá, Paraná, Brazil (2019).

Domain	Period	Median ± interquartile range	p- Value *	SF36 score level (%)				
				0 - 20 Very poor	21 - 40 Poor	41 - 60 Regular	61 - 80 Good	81 - 100 Very good
Social aspects	Pre	25 ± 68.75	<0.001	38.7	19.4	12.9	3.2	25.8
	Post	100 ± 12.50		0%	0%	0%	22.6	77.4
Functional capacity	Pre	0 ± 17.50	<0.001	77.4	9.7	9.7	3.2	0
	Post	85 ± 40.00		3.2	3.2	25.8	16.1	51.7
Pain	Pre	30 ± 35.50	<0.001	40	30	30	0	0
	Post	84 ± 16.00		5	0	5	10	80
General health status	Pre	30 ± 15.00	<0.001	9.7	71.0	19.3	0	0
	Post	57 ± 6.50		3.2	6.5	74.2	16.1	0
Limitation due to emotional aspects	Pre	0 ± 66.67	<0.001	58.1	12.9	0	12.9	16.1
	Post	100 ± 0.00		6.4	0.0	0.0	0.0	93.6
Limitation due to physical aspects	Pre	0 ± 25.00	<0.001	70.9	16.1	6.5	6.5	0.0
	Post	100 ± 0.00		9.7	0.0	3.2	0.0	87.1
Mental health	Pre	36 ± 36.00	<0.001	32.2	25.8	19.4	6.5	16.1
	Post	92 ± 16.00		0.0	0.0	3.2	29.1	67.7
Vitality	Pre	25 ± 35.00	<0.001	48.3	16.1	22.6	13.0	0.0
	Post	95 ± 22.50		0.0	0.0	0.0	32.3	67.7

Source: Riedo CO, et al., 2023.

In the evaluation of functional capacity, the median of the score in the pre-PRP period was 0 (IIQ ± 17.50), and, in the post-PRP, the median was 85 (IIQ ± 40.0), with statistical significance in the paired test of Wilcoxon with p-value <0.001. In the quantitative evaluation of the SF-36 score, it was observed that in the pre-PRP period, most patients were at the level of 0 to 20% of the score (n=24; 77.4%) and in the post-PRP period, the majority (n=19; 51.6%) had a score ranging from 81 to 100%.

For the evaluation of the SF-36 pain domain, the median score in the pre-PRP was 30 (IIQ ± 35.50), and in the post-PRP, it was 84 (IIQ ± 16.0), with statistical significance in the paired test of Wilcoxon with p-value <0.001. In the quantitative evaluation of the SF-36 score, it was found that in the pre-PRP period most patients were at the level of 0 to 20% of the score (n=12; 40%) and in the post-PRP period, the majority (n=25; 80.0%) had a score ranging from 81 to 100%.

In the subjective assessment of the general health status, the median score in the pre-intervention period with the PRP was 30 (IIQ ± 15.50), and in the post-PRP, the median was 57 (IIQ ± 6.50), with statistical significance in the Wilcoxon paired test with p-value <0.001. As for the score levels in this domain, it was observed that most patients (n=22; 71%) were in the range of 20 to 40% of the SF-36 score. In the post-intervention evaluation with PRP, on the other hand, there was an evolution in the subjective assessment of health status, with the majority of patients (n=22, 74.2%) fitting within the score range of 41 to 60% and 16.1 (n = 5) fitting in the range of 61 to 80%.

As for the SF-36 domain, limitation due to emotional aspects, the median of the score in the pre-intervention period with the PRP was 0 (IIQ ± 66.67), and in the post-PRP, the median was 100 (IIQ ± 0, 00), with statistical significance in the Wilcoxon paired test with p-value <0.001.

It was observed that in the pre-intervention with the PRP, most patients (n=18; 58.1%) were at the score levels from 0 to 20%. In the post-PRP intervention period, most patients (n=29; 93.6%) were classified as 81 to 100%. Regarding the SF-36 domain, limitation due to physical aspects, the median score was 0 in the pre-intervention period with the PRP (IIQ ± 25.0), and in the post-PRP period, the median was 100 (IIQ ± 0.00), with statistical significance in the Wilcoxon paired test with p-value <0.001. It was found that in the pre-intervention period with the PRP, most patients (n=21; 71.0%) were at score levels from 0 to 20%. In the post-intervention period with the PRP, most patients (n=27; 87.1%) were classified at the 81 to 100% level.

In the SF-36 Mental Health domain, it was found that in the pre-intervention period with the PRP the median of the score was 36 (IIQ ± 36.0) and in the post-PRP period, the median was 92 (IIQ ± 16.0), with statistical significance in the Wilcoxon paired test with p-value <0.001. It was observed that in the pre-intervention period with the PRP, most patients (n=10; 32.3%) were at a score level of 0 to 20%. In the post-intervention period with the PRP, the majority of patients (n=21; 67.6%) were classified at the level of 81 to 100%.

Finally, the SF-36 vitality domain showed the following result: in the pre-intervention period with the PRP the score median was 25 (IIQ ± 35.0), and in the post-PRP period the median was 95 (IIQ ± 22.50), with statistical significance in the Wilcoxon paired test with p-value <0.001.

It was observed that in the pre-intervention period with the PRP, most patients (n=15; 48.4%) were at a score level of 0 to 20%. In the post-intervention period with the PRP, most patients (n=21; 67.7%) were classified in the level of 81 to 100%. The data related to the application of the Lequesne Algofunctional Questionnaire in the pre-intervention and post-intervention moments (intra-articular injection of the PRP) are detailed in **Table 4**.

Table 4 - Frequency distribution of the final score of the Lequesne instrument in the pre- and post- injection period with PRP in thirty-one patients with knee OA and the result of the Wilcoxon paired test, in Maringá, Paraná, Brazil (2019).

Category of physical capacity impairment	Pre-intervention n (%)	Post-intervention n (%)	p-Value
Little impairment	0 (0%)	19 (61.2%)	<0.001*
Moderate	0 (0%)	6 (19.3%)	
Severe	0 (0%)	2 (6.5%)	
Very severe	0 (0%)	2 (6.5%)	
Extremely severe	31 (100.0%)	2 (6.5%)	
Median score	25	3	
Interquartile range	± 4	± 6	

* Significance of the non-parametric Wilcoxon Paired Test. **Source:** Riedo CO, et al., 2023.

On average, 1 to 4 applications were performed with an average interval of 2 to 6 months between applications. Before the PRP knee injection, all patients had pain and functional limitations that classified them in the extremely severe category. At the post-intervention moment, about 80.64% of the patients showed a significant improvement, with a decrease in pain and disabilities.

DISCUSSION

This study is among the first ones in Brazil to assess the perception of patients with knee OA, their quality of life, and their functional capacity in the pre- and post-treatment periods with intra-articular injection of PRP. As for the clinical characteristics of patients before treatment with PRP, all of them had disabling pain, severe pain, even at rest, and pain after thirty minutes of activity. The main results of this study were listed as

sociodemographic aspects, clinical characterization of patients before treatment with PRP, the evolution of Lequesne's Algofunctional assessment in the pre- and post-treatment periods. Statistical significance was observed in all SF-36 domains, in the of the quality of life assessment and the pre and post-PRP periods (ALMEIDA GPL, et al., 2021).

Regarding sociodemographic characteristics, most subjects in this study were between 58 and 87 (67.80%) years old, and white women (67.74%). Knee OA has an equal distribution in both genders, and in women, the incidence is higher in post-menopause (KÜMPEL C, et al., 2016). The sociodemographic characteristics of the subjects in this research were similar to other studies in which it was also observed that the majority of patients were female (RAEISSADAT SA, et al., 2013; RAYEGANI SM, et al., 2014), with an average of 50 years old (MARTINI L, et al., 2017; RAEISSADAT S, et al., 2013). Some factors may explain the higher prevalence of OA in women. Women are more concerned with their body image, which leads them to seek health treatment more often than men (HOSSEINI SA and PADHY RK, 2022; SILVA GA and LANGE SN, 2010).

The average age of the participants was almost 60 years, with these women being post-menopausal. Another issue that may lead to a higher prevalence of OA in women is the fact that they are more affected by obesity after the age of 40, which is an etiological risk factor for knee OA (HART HF, et al., 2019). As for the ethnic pattern, white and brown were predominant in the state of Paraná (INSTITUTO PARANAENSE DE DESENVOLVIMENTO ECONÔMICO E SOCIAL (IPARDES), 2018). Pain and functional deficit are the main complaints that lead the patient to seek treatment for knee OA (DELGADO D, et al., 2019; KNOP E, et al., 2016; POPESCU MN, et al., 2021).

The etiology of knee OA is multifactorial and not yet fully understood. However, it is known that age, obesity, misalignment of the lower limbs, cartilage defects, joint instabilities, previous fractures, and ligament and meniscus surgeries are strongly correlated with their manifestation (MARTINI L, et al., 2017). In general, some conditions can cause joint damage, such as unfavorable biomechanical conditions, resulting in the overload that exceeds the capacity for the joint to remain stable, and this predisposes knee OA (KANCHANATAWAN W, et al., 2016; TEY RV, et al., 2022; XU Z, et al., 2017). This clinical condition causes a significant decrease in the functional capacity of the people affected, resulting in loss of independence and difficulty in carrying out activities of daily living.

Regarding the final score of the Lequesne Algofunctional instrument in the pre-intervention, there was a very significant decrease in the quality of life and functional capacity of the people affected, resulting in loss of independence and difficulty in carrying out daily activities. All thirty-one subjects were in severe condition. In the post-intervention, more than 70% had little or moderate impairment, with a decrease in the painful symptom and an improvement in functionality (p-value <0.001). Similar results for relief of painful symptoms have been reported (KON E, et al., 2011; MEHEUX CJ, et al., 2016; WU YT, et al., 2018), it was observed that the intra-articular injection of PRP provided prolonged relief of pain, stiffness and improved functional capacity, with better results observed in patients who were simultaneously treated with physical activity, whose objective was to strengthen muscles (MEHEUX CJ, et al., 2016).

Improvement was perceived in all domains of SF-36, however, the general health status domain, although statistically significant, was the one with the lowest increase. This result is due to the fact that in this specific question, the respondent may not consider only the aspects involving the knees. It should be considered that study subjects are adults who are working and who evaluated their general health status as being good. This finding is corroborated by other studies that found improvements in the physical domains, with less intense maintenance or improvement in the psychological domains (RAYEGANI SM, et al., 2014). There was also an increase in SF-36 scores in all domains, indicating the potential of this treatment in terms of pain relief, functional improvement, and physical and psychological aspects of quality of life. This finding has already been observed in another study that used PRP during knee arthroscopy (DUIF C, et al., 2015). Pain is a subjective symptom, differing from one person to another and can be minimized or maximized, depending on the individual's psychological state. In a study with patients with knee OA-related pain, it was found that unfavorable psychological conditions, such as depression, may be associated with increased knee pain intensity with no specific relationship with physical activity (IIJIMA H, et al., 2018).

This result may explain the more marked improvement observed in the physical domains of SF-36. However, it should be noted that patients who showed improvement in pain also evolved with improvement in SF-36 scores in the psychological domain. In this sense, the standard treatment of pain in patients with OA, which predominantly adopts a biomedical approach, should be replaced by a more holistic approach (MILLS K, et al., 2019). Functional capacity represents the daily independence of these individuals, something relevant to physical and psychosocial health. It is for this reason that these functional limitations trigger a notable negative impact on some aspects that constitute the quality of life (KÜMPEL C, et al., 2016).

Functional improvement and pain reduction in patients with knee OA who received treatment with PRP has already been the object of study, and its results corroborate what was found in the present study. In a survey of 261 patients with knee OA (152 men and 109 women), it was found that after treatment with PRP, there was an improvement with statistically significant values in the scores for decreased pain, improved functional capacity, with consequent higher development capacity activities of daily living. This conclusion was evidenced by a systematic review and meta-analysis study in which scientific evidence of decreased pain and improved stiffness was observed, allowing qualitative changes in the patients' lifestyle (KANCHANATAWAN W, et al., 2016; RAMPAL S, et al., 2022).

This study showed a significant improvement in the Algofunctional assessment of Lequesne and the quality of life analyzed by the SF-36, in the physical and psychological domains. In a prospective study on routine care of patients who received a single injection of PRP, an improvement was observed in the scores of the physical domains of the SF-36. However, unlike the present study, there was no statistical significance in the psychological domains (GUILLIBERT C, et al., 2019).

In an evaluation that took into account the increase in the physical and psychological scores of SF-36, in samples of 31 (RAYEGANI S, et al., 2014) and 71 patients (PATEL S et al., 2013) the results were similar to those found in the present study, as they presented statistical significance in the physical and psychological test of SF-36 domains.

As limitations of this study, we highlight the fact that data collection took place in a single moment, after the treatment, using the patient's memory to obtain the information related to the pre- and post-PRP periods and also the small sample analysed. However, data were subjected to robust statistical tests.

The peculiarity of this study was the focus on the interviewee's perception about their quality of life and functional capacity in the pre- and post-treatment with PRP. All numerical and statistically significant data corroborated with the subject's speech. The patient's responses were very evident when expressing relief and a feeling of well-being, a fact that was confirmed by statistical analysis.

CONCLUSION

PRP injection treatment has been shown to be effective in reducing joint pain and stiffness, improving functional capacity, and enhancing the quality of life in elderly patients with knee osteoarthritis (OA). It is an accessible, autologous, low-cost, and minimally invasive treatment option. The findings of this study further contribute to the growing body of evidence supporting the positive impact of PRP on knee OA. However, despite the promising results observed, it is important to note that further research is needed to validate and consolidate these findings. Larger sample sizes, longer follow-up periods, and rigorous comparative studies would provide more comprehensive insights into the efficacy and long-term benefits of PRP interventions for knee OA patients. In conclusion, the results of this study demonstrate the potential of PRP injections to significantly improve the functional capacity and overall quality of life of patients with knee osteoarthritis. The reduction in pain and disability observed highlights the value of PRP as a therapeutic intervention for managing knee OA symptoms. Nonetheless, continued research efforts are essential to establish the optimal protocols, better understand the underlying mechanisms, and determine the appropriate patient selection criteria for PRP treatment in knee osteoarthritis.

REFERENCES

1. AGRESTI A. An introduction to categorical data analysis. Third ed. Hoboken, NJ, UEA, NJ, UEA: John Wiley & Sons, 2019.
2. ALMEIDA GPL, et al. Reliability, validity and responsiveness of the Step Up and Down (StUD) test for individuals with symptomatic knee osteoarthritis. *Musculoskeletal Science and Practice*, 2021; 56: 102454.
3. COGNASSE F, et al. The Non-Haemostatic Response of Platelets to Stress: An Actor of the Inflammatory Environment on Regenerative Medicine? *Frontiers in Immunology*, 2021; 12.
4. DELGADO D, et al. Current concepts in intraosseous Platelet-Rich Plasma injections for knee osteoarthritis. *Journal of Clinical Orthopaedics and Trauma*, 2019; 10(1): 36–41.
5. DUIF C, et al. Does intraoperative application of leukocyte-poor platelet-rich plasma during arthroscopy for knee degeneration affect postoperative pain, function and quality of life? A 12-month randomized controlled double-blind trial. *Archives of Orthopaedic and Trauma Surgery*, 2015; 135(7): 971–977.
6. FREIRE MR DE M, et al. Efeito comparativo entre a infiltração de plasma rico em plaquetas e o uso de corticosteroides no tratamento de osteoartrite do joelho: Estudo clínico prospectivo e randomizado. *Revista Brasileira de Ortopedia*, 2020; 55(05): 551–556.
7. GUILLIBERT C, et al. Single Injection of High Volume of Autologous Pure PRP Provides a Significant Improvement in Knee Osteoarthritis: A Prospective Routine Care Study. *International Journal of Molecular Sciences*, 2019; 20(6): 1327.
8. HART HF, et al. Obesity is related to incidence of patellofemoral osteoarthritis: the Cohort Hip and Cohort Knee (CHECK) study. *Rheumatology International*, 2019.
9. HOSSEINI SA e PADHY RK. Body Image Distortion. 2022.
10. IJIMA H, et al. Psychological health is associated with knee pain and physical function in patients with knee osteoarthritis: an exploratory cross-sectional study. *BMC Psychology*, 2018; 6(1): 19.
11. INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. Projeções da População do Brasil e Unidades da Federação por sexo e idade: 2010-2060. Projeções de população por sexo e idade, 2018. Disponível em: <<https://www.ibge.gov.br/estatisticas/sociais/populacao/9109-projecao-da-populacao.html?edicao=21830&t=resultados>>. Acessado em: 16 de outubro de 2019.
12. INSTITUTO PARANAENSE DE DESENVOLVIMENTO ECONÔMICO E SOCIAL (IPARDES). Caderno estatístico do Paraná. Instituto Paranaense de Desenvolvimento Econômico e Social, 2018.
13. KANCHANATAWAN W, et al. Short-term outcomes of platelet-rich plasma injection for treatment of osteoarthritis of the knee. *Knee Surgery, Sports Traumatology, Arthroscopy Springer Verlag*, 2016.
14. KNOP E, et al. Plasma rico em plaquetas no tratamento da osteoartrite. *Revista Brasileira de Reumatologia*, 2016; 56(2): 152–164.
15. KON E, et al. Platelet-rich plasma intra-articular injection versus hyaluronic acid viscosupplementation as treatments for cartilage pathology: From early degeneration to osteoarthritis. *Arthroscopy - Journal of Arthroscopic and Related Surgery*, 2011; 27(11): 1490–1501.
16. KÜMPEL C, et al. Impact of a structured aquatic therapy program on patients with knee osteoarthritis. *Acta Fisiátrica*, 2016; 23(7): 361–387.
17. LAGUARDIA J, et al. Brazilian normative data for the Short Form 36 questionnaire, version 2. *Revista Brasileira de Epidemiologia*, 2013; 16(4): 889–897.
18. LI W, et al. The application of platelet-rich plasma in the treatment of knee osteoarthritis: A literature review. *Journal of Orthopaedic Science*, 2022; 27(2): 420–428.
19. MARTINEZ EZ. Bioestatística para os cursos de graduação da área da saúde: noções de métodos não paramétricos. São Paulo - SP, 2015.
20. MARTINI L, et al. Single Platelet-Rich Plasma Injection for Early Stage of Osteoarthritis of the Knee. *Joints*, 2017; 05(01): 002–006.
21. MARX FC, et al. Tradução e validação cultural do questionário algofuncional de Lequesne para osteoartrite de joelhos e quadris para a língua portuguesa. *Revista Brasileira de Reumatologia*, 2006; 46(4): 253–260.
22. MEHEUX CJ, et al. Efficacy of Intra-articular Platelet-Rich Plasma Injections in Knee Osteoarthritis: A Systematic Review. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, 2016; 32(3): 495–505.
23. MILLS K, et al. Current concepts in joint pain in knee osteoarthritis. *Der Schmerz*, 2019; 33(1): 22–29.
24. MUCHEDZI TA e ROBERTS SB. A systematic review of the effects of platelet rich plasma on outcomes for patients with knee osteoarthritis and following total knee arthroplasty. *Surgeon*, 2018; 16(4): 250–258.
25. PATEL S, et al. Treatment With Platelet-Rich Plasma Is More Effective Than Placebo for Knee Osteoarthritis. *The American Journal of Sports Medicine*, 2013; 41(2): 356–364.
26. PAVANI AA e FERNANDES TRL. Plasma rico em plaquetas no rejuvenescimento cutâneo facial: uma revisão de literatura. *Revista Uningá Review*, 2017; 29(1): 227–236.

27. POPESCU MN, et al. Autologous Platelet-Rich Plasma Efficacy in the Field of Regenerative Medicine: Product and Quality Control. *BioMed Research International*, 2021: 1–6.
28. R DEVELOPMENT CORE TEAM. R: a language and environment for statistical computing. R Foundation for Statistical Computing, 2021.
29. RAEISSADAT SA, et al. The Effect of Platelet-Rich Plasma on Pain, Function, and Quality of Life of Patients with Knee Osteoarthritis. *Pain Research and Treatment*, 2013; 1–7.
30. RAHIMZADEH P, et al. The effects of injecting intra-articular platelet-rich plasma or prolotherapy on pain score and function in knee osteoarthritis. *Clinical Interventions in Aging*, 2018; 13: 73–79.
31. RAMPAL S, et al. A review of the efficacy of intraarticular hip injection for patients with hip osteoarthritis: To inject or not to inject in hip osteoarthritis? *Joint Diseases and Related Surgery*, 2022; 33(1): 255–262.
32. RAYEGANI SM, et al. Does intra articular platelet rich plasma injection improve function, pain and quality of life in patients with osteoarthritis of the knee? A randomized clinical trial. *Orthopedic Reviews*, 2014; 6(3).
33. SHEN L, et al. The temporal effect of platelet-rich plasma on pain and physical function in the treatment of knee osteoarthritis: systematic review and meta-analysis of randomized controlled trials. *Journal of Orthopaedic Surgery and Research*, 2017; 12(1): 16.
34. SILVA GA e LANGE ESN. Corporal image: The perception of the concept in obese female. *Psicol. Argum.*, 2010; 28(60): 43–54.
35. TEY RV, et al. Variability in Platelet-Rich Plasma Preparations Used in Regenerative Medicine: A Comparative Analysis. *Stem Cells International*, 2022; 1–20.
36. USLU GÜVENDI E. Comparison of Efficiency Between Corticosteroid and Platelet Rich Plasma Injection Therapies in Patients With Knee Osteoarthritis. *Archives of Rheumatology*, 2019; 33(3): 273–281.
37. WU YT, et al. Effects of Platelet-Rich Plasma on Pain and Muscle Strength in Patients With Knee Osteoarthritis. *American Journal of Physical Medicine & Rehabilitation*, 2018; 97(4): 248–254.
38. XU Z, et al. Efficacy of Platelet-Rich Plasma in Pain and Self-Report Function in Knee Osteoarthritis. *American Journal of Physical Medicine & Rehabilitation*, 2017; 96(11): 793–800.