Management of osteoarthritis with injectable therapies: prp vs. Hyaluronic acid

Manejo de osteoartrite com terapias injetáveis: Prp vs. Ácido hialurônico

Manejo de la osteoartritis con terapias inyectables: Prp vs. Ácido hialurônico

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RESUMO

Objetivo: Este estudo tem como objetivo comparar a eficácia e a segurança do PRP e do HA no tratamento da OA, analisando dor, rigidez, funcionalidade e duração dos efeitos terapêuticos. Métodos: Foi realizada uma revisão sistemática com base em estudos publicados nos últimos cinco anos. Dos 352 artigos identificados, 19 foram incluídos para essa revisão. Resultados: Os resultados indicam que o PRP apresenta maior eficiência na redução da dor e na melhora funcional a longo prazo, com efeitos mantidos por até 12 meses. O HA mostrou-se eficaz para alívio sintomático de curto prazo, sendo uma opção para pacientes com OA leve. A combinação de PRP e HA pode oferecer benefícios adicionais, mas sua viabilidade depende de fatores como custo e disponibilidade. Conclusão: Conclui-se que ambas as terapias são eficazes, mas o PRP demonstra superioridade em relação à duração dos efeitos terapêuticos. Estudos futuros devem explorar combinações terapêuticas e otimização das dosagens para um tratamento mais personalizado.

Descritores: Osteoartrite; Plasma Rico em Plaquetas; Ácido Hialurônico.

ABSTRACT

Objective: This study aims to compare the efficacy and safety of PRP and HA in OA treatment, analyzing pain, stiffness, functionality, and duration of therapeutic effects. Methods: A systematic review was conducted based on studies published in the last five years. Out of 352 identified articles, 19 were included. Results: The results indicate that PRP is more effective in reducing pain and improving long-term functionality, with effects lasting up to 12 months. HA proved effective for short-term symptomatic relief, making it a viable option for patients with mild OA. The combination of PRP and HA may offer additional benefits, but its feasibility depends on factors such as cost and availability. Conclusion: It is concluded that both therapies are effective, but PRP demonstrates superiority in the duration of therapeutic effects. Future studies should explore therapeutic combinations and dosage optimization for more personalized treatment.

Descriptors: Osteoarthrosis; Platelet-Rich Plasma; Hyaluronic Acid.

RESUMEN

Objetivo: Este estudio tiene como objetivo comparar la eficacia y la seguridad del PRP y del HA en el tratamiento de la OA, analizando el dolor, la rigidez, la funcionalidad y la duración de los efectos terapéuticos. Métodos: Se realizó una revisión sistemática basada en estudios publicados en los últimos cinco años. De los 352 artículos identificados, 19 fueron incluidos en esta revisión. Resultados: Los resultados indican que el PRP presenta mayor eficiencia en la reducción del dolor y en la mejora funcional a largo plazo, con efectos mantenidos por hasta 12 meses. El HA ha demostrado ser eficaz para el alivio sintomático a corto plazo, siendo una opción para pacientes con OA leve. La combinación de PRP y HA puede ofrecer beneficios adicionales, pero su viabilidad depende de factores como costo y disponibilidad. Conclusión: Se concluye que ambas terapias son eficaces, pero el PRP demuestra superioridad en relación con la duración de los efectos terapéuticos. Estudios futuros deben explorar combinaciones terapéuticas y optimización de las dosis para un tratamiento más personalizado.

Descriptores: Osteoartritis; Plasma Rico en Plaquetas; Ácido Hialurónico

REVIEW

Introduction

Osteoarthritis (OA) is a chronic and progressive condition that affects millions of people worldwide and is one of the leading causes of joint pain and functional disability in adults, especially the elderly. Characterized by the degradation of articular cartilage, changes in the subchondral bone, and inflammation of the synovial membrane, the disease significantly impacts patients' quality of life, interfering with daily activities and work capacity. The treatment of OA presents complex challenges, as traditional methods such as analgesics, anti-inflammatory drugs, and physical therapy often fail to slow disease progression, being limited to symptom management.[2]

In recent years, minimally invasive intra-articular therapies such as hyaluronic acid (HA) and platelet-rich plasma (PRP) have gained prominence due to their benefits in both symptom relief and functional improvement of the affected joints. Hyaluronic acid is a substance naturally present in synovial fluid, known for its viscoelastic properties and its ability to lubricate and cushion the joint, in addition to exerting anti-inflammatory effects.[2] PRP, on the other hand, derived from the patient's own blood, is rich in growth factors that stimulate tissue regeneration and modulate inflammation, and is considered a promising alternative for regenerative interventions. Given the diversity of therapeutic options and the limitations associated with conventional treatments, it is essential to evaluate the comparative effectiveness of PRP and HA to provide evidence that can assist in choosing the most appropriate approach for managing osteoarthritis.[3]

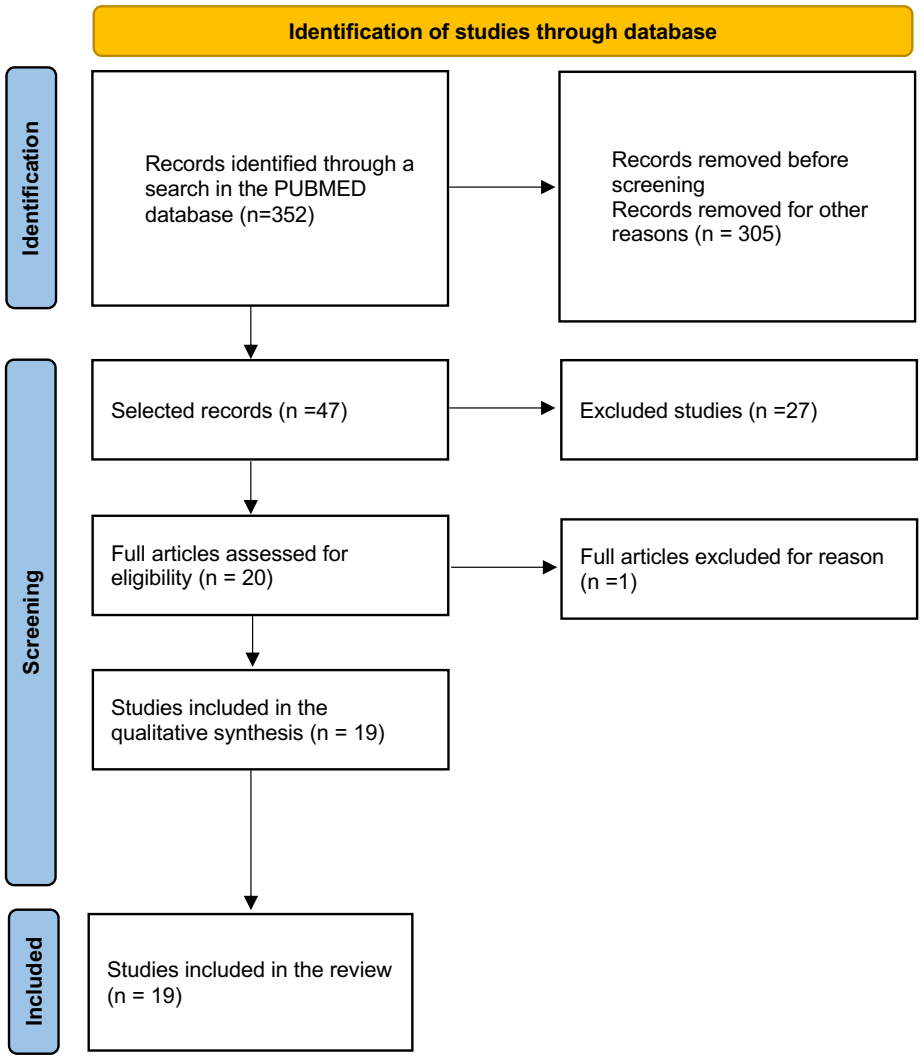
In this context, the aim of this study is to compare the efficacy and safety of platelet-rich plasma and hyaluronic acid in the treatment of osteoarthritis, analyzing aspects such as pain relief and joint stiffness, improvement in functionality and patients' quality of life, duration of therapeutic effects, impact on disease progression, and the risk of adverse events associated with each intervention. Furthermore, the study seeks to investigate how factors such as osteoarthritis severity, patient profile, and intervention characteristics—including dosage, frequency, and therapeutic combinations—influence outcomes, providing support for selecting the most suitable approach according to the clinical profile of each patient.

Methodology

To identify articles comparing the use of platelet-rich plasma (PRP) and hyaluronic acid (HA) in the treatment of osteoarthritis, a systematic literature review was conducted following the guidelines of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist. Data collection was carried out in the PubMed database using descriptors and the combination of Boolean operators "AND" and "OR", as follows: "Osteoarthritis", "Osteoarthrosis", "Degenerative arthritis", "Arthrosis", "Injections", "Injection Therapy", "Therapeutic Injections", "Hyaluronic Acid", "Platelet-Rich Plasma", and "PRP". Study selection and analysis were independently performed by three reviewers, who subsequently compared the results for confirmation.

The inclusion criteria adopted were: free full-text availability, patients diagnosed with osteoarthritis, studies addressing osteoarthritis treatment with both PRP and hyaluronic acid, studies published in Portuguese or English, studies involving adults, clinical trials, meta-analyses, randomized controlled trials, and studies published within the last five years.

Conversely, exclusion criteria included: studies without clear comparisons between the two approaches, studies not involving patients with osteoarthritis, studies with incomplete data, studies involving non-adult populations (under 18 years of age), reviews, non-controlled or non-randomized studies, studies without relevant outcomes, articles published in languages other than English or Portuguese, and studies published before 2019.



Results

A total of 352 articles were identified in the PUBMED database, of which 47 were selected for full-text reading. After applying the inclusion and exclusion criteria, 19 studies were included in the review, comprising 10 randomized clinical trials and 9 meta-analyses or systematic reviews. The studies analyzed the efficacy of platelet-rich plasma (PRP) and hyaluronic acid

(HA) in the treatment of osteoarthritis, comparing their effects on pain, joint stiffness, and functionality in both the short and long term.

Among the randomized clinical trials, Raeissadat et al.[1] compared PRP, PRGF, HA, and ozone, showing that while ozone provided greater initial relief, PRP and PRGF had more lasting effects at six and twelve months. Similar results were observed by Bansal et al.[5] and Nouri et al.[6], who highlighted the superiority of PRP over HA in improving joint function and reducing long-term inflammation. Furthermore, Wang et al.[14] and Luo et al.[15] confirmed that PRP outperforms HA, particularly after the third month of treatment, with more significant benefits observed in overweight and obese patients. Sun et al.[16] compared PRP alone and PRP combined with HYAJOINT Plus, finding that PRP alone led to greater pain reduction in the first month, whereas the combination performed better at six months.

Other clinical trials investigated PRP dosage and its efficacy compared to other treatments. Bansal et al.[5] showed that high-concentration PRP (10 billion platelets) led to sustained improvements in WOMAC and IKDC scores for up to one year, while HA effects were limited to the first month. Conversely, Tschopp et al.[4] found no significant differences between PRP, HA, corticosteroids, and placebo in pain reduction after six months. Kesiktas et al.[11] compared PRP, HA, and peptides, observing improvement across all groups in the first week, with peptides providing the greatest pain reduction at three months. Huang et al.[12] evaluated PRP combined with different hyaluronans and found both combinations resulted in significant functional improvement, with PRP + Artz reducing stiffness more effectively and PRP + HYAJOINT Plus enhancing balance. In the context of glenohumeral osteoarthritis, Kirschner et al.[13] found that leukocyte-poor PRP (LP-PRP) and HA both yielded similar improvements in pain and function, with no significant differences.

Meta-analyses reinforced the superior efficacy of PRP compared to HA, particularly in the long term. Zhu et al.[2] and Filardo et al.[3] demonstrated that PRP promotes faster functional recovery and sustained pain relief, without an increase in adverse events. Wu et al.[8] and Tang et al.[9] supported these findings, emphasizing that PRP improves joint functionality more than HA, although some scores, such as KOOS, did not show statistically significant differences. Cao et al.[10] found that PRP's peak efficacy occurs between two and three months post-injection and that factors such as age, BMI, and osteoarthritis severity influence the outcomes. Luo et al.[15] demonstrated that PRP is more effective in overweight or obese patients, especially after the third month of treatment.

Other analyses compared different therapeutic approaches. Xue et al.[7] indicated that PRP is the best initial option for mild to moderate knee osteoarthritis, while the combination of PRP and HA may be viable depending on cost and preparation. Phillips et al.[18] suggested that high molecular weight HA offers consistent benefits in pain and function, but PRP results tend to be more variable. Finally, Presa et al.[19] analyzed intra-articular injections for rotator cuff injuries, concluding that the combination of corticosteroids and HA was the most effective, followed by PRP and prolotherapy.

Overall, the studies indicate that PRP has advantages over HA in reducing pain and improving joint function, especially in the medium and long term. Clinical trials show that PRP provides more durable effects than HA and, in some cases, is comparable to treatments such as corticosteroids or peptides.

Meta-analyses reinforce its efficacy, although factors like age, BMI, and osteoarthritis severity influence treatment response. The combination of PRP and HA may be a promising alternative in certain cases, though its feasibility depends on factors such as cost and availability.

Discussion

Osteoarthritis (OA) is a degenerative joint disease that primarily affects the hip, knee, and hand joints. Regarding its pathophysiology, key features include degradation of the articular cartilage, bone changes, and synovial inflammation. These changes result in pain, stiffness (typically lasting less than 30 minutes), and limited range of motion, significantly impacting patients' quality of life. Furthermore, the development of OA is associated with various factors, such as aging, obesity, joint injuries, and a genetic predisposition, according to Conley et al.[20]

In this context, several management options are available for OA, which can be divided into non-pharmacological, pharmacological, and surgical treatments. First-line treatment includes physical exercise and weight loss for overweight or obese individuals, along with physical therapy. These methods are recommended to reduce pain and improve joint function[20]. On the other hand, pharmacological approaches involve the use of non-steroidal anti-inflammatory drugs (NSAIDs) and, more recently, intra-articular injections of hyaluronic acid (HA) and platelet-rich plasma (PRP). In chronic cases, arthroplasty may be necessary (Chavda et al., 2022)[21].

Hyaluronic acid (HA) is a high-molecular-weight polysaccharide naturally found in synovial fluid, playing a crucial role in joint lubrication and shock absorption. In OA, degradation of endogenous HA leads to a loss of these functions, exacerbating friction and joint wear. Exogenous HA, administered via intra-articular injections, acts to partially restore the viscoelastic properties of synovial fluid and has anti-inflammatory effects by inhibiting cytokines and enzymes that degrade the cartilage matrix. It also stimulates the synthesis of proteoglycans and the proliferation of chondrocytes, contributing to cartilage repair and pain relief[21].

Conversely, platelet-rich plasma (PRP) contains a high concentration of growth factors such as PDGF and TGF-β, which promote chondrocyte proliferation and regeneration of the cartilage matrix. Additionally, PRP has anti-inflammatory effects by modulating cytokines such as IL-1 and inhibiting catabolic pathways like WNT, which are responsible for cartilage degradation. This combination of regenerative and anti-inflammatory effects makes PRP a therapeutic option that may not only relieve pain but also slow OA progression[22].

To analyze both therapeutic options, the selected articles in this study used different scales, including the International Knee Documentation Committee Subjective Knee Form (IKDC), the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), the Visual Analog Scale (VAS), and the KOOS. The IKDC is a knee-specific scale composed of 18 items that assess symptoms such as pain, stiffness, swelling, and instability, as well as functions related to daily activities. The WOMAC is aimed at patients with painful arthritis in the knee or hip and contains five items evaluating pain during activities such as walking and climbing stairs, using a five-point Likert

scale. The VAS measures pain on a continuous scale by asking the patient to mark their level of pain on a 10 cm line, with 0 representing "no pain" and 10 "worst possible pain," and is widely used to monitor pain progression in various conditions. Finally, the KOOS is also knee-specific, comprising 42 items divided into five subscales: pain, other symptoms, function in daily living, sports and recreation, and knee-related quality of life.

Thus, the present study aims to compare these two alternatives, revealing that both platelet-rich plasma (PRP) and hyaluronic acid (HA) are effective in treating osteoarthritis but offer different advantages depending on the therapeutic focus and duration of effects. Studies such as Raeissadat et al.[1] show that PRP provides superior and longer-lasting effects compared to HA, especially in longer follow-up periods, suggesting greater efficacy of PRP for prolonged pain relief and functional improvement[1].

Meta-analyses by Zhu et al. and Tang et al. also support that PRP offers greater efficacy in short-term functional recovery and long-term pain relief compared to HA, making it a more suitable option for patients seeking more durable clinical benefits (Zhu et al.; Tang et al.). Filardo et al.[3] and Wu et al.[8] also found that PRP yields stronger responses in pain and joint function scores over 12 months, highlighting its superiority over HA in patients with moderate to advanced knee OA[3],[8].

On the other hand, some studies, such as those by Tschopp et al.[4] and Phillips et al.[18], indicate that HA, especially in high-molecular-weight formulations, remains effective, providing consistent improvements in pain and function, although less durable than PRP[4],[18]. This suggests that HA may be preferable for patients who need short-term symptomatic relief or who have contraindications to PRP.

In conclusion, while HA remains a viable alternative, PRP shows considerable advantages in terms of durability and therapeutic effectiveness for osteoarthritis, especially in chronic conditions and for long-term relief. Therefore, the choice between PRP and HA should consider the patient's profile and the nature of the condition, with PRP standing out as a superior option for sustainable benefits.

Conclusion

Based on this systematic review, platelet-rich plasma and hyaluronic acid have proven to be effective options in reducing osteoarthritis symptoms associated with pain, stiffness, and quality of life. However, the results indicate that PRP has superior results, especially in the duration of effects and symptom reduction. Thus, therapy with PRP injections compared to HA for osteoarthritis showed significant improvements in short-term functional recovery, pain reduction after 3 months of application, and progress in stiffness and function after 3 and 6 months of follow-up. The highest effectiveness of PRP use is achieved peak between two and three months after injection. Similarly, in the long term, the effects of PRP were superior and long-lasting compared to HA.

The studies have shown improvement in function, pain, and stiffness, without an increased risk of adverse events, as well as a significant reduction in inflammatory cytokines. This suggests that the use of PRP may be indicated for patients with moderate to advanced osteoarthritis seeking long-lasting beneficial results. However, HA is still a viable option for milder osteoarthritis

or when an immediate effect of symptom relief is needed. Nevertheless, some limitations must be considered, such as differences in dosage, variation in assessment scales, and heterogeneity of study protocols. Thus, clinical benefits could be enhanced in future studies focusing on different degrees of osteoarthritis, subgroups with comorbidity, and different profiles.

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