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Evaluation of the Effects of Hyaluronic Acid on Knee Joint Osteoarthritis

Dr. Khwaja Noor Mohammad Faiz[1], Dr. Mohammad Jawid Ebrahimi[2]

[1]Orthopedic surgeon and head of the Orthopedic Department at the Abu Ali Sina Regional Teaching Hospital in Mazar-e-Sharif, Balkh Province.
[2]Orthopedic surgeon and Dean of the Faculty of Medicine at Taj University, Mazar-e-Sharif, Balkh Province.

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Abstract: **Background and Purpose:** Knee osteoarthritis (OA) is a degenerative joint disease that commonly affects middle-aged and elderly individuals. It results in cartilage degradation, pain, inflammation, and limited mobility. This study explores the therapeutic effects of hyaluronic acid (HA) on the symptoms of knee OA, focusing on its ability to alleviate pain, improve joint function, and enhance the quality of life for patients.
Methodology: This research is a library-based review, analyzing scientific literature and clinical studies on the use of intra-articular HA injections in treating knee OA. The review synthesizes data from various meta-analyses, clinical trials, and systematic reviews to evaluate the efficacy and safety of HA injections.
Key Findings: The findings suggest that HA injections can effectively reduce pain, improve joint mobility, and enhance the quality of life for patients suffering from knee OA. These benefits are typically observed within weeks to months after the injections. However, there are limitations, including high treatment costs and the need for repeated injections, which may affect patient adherence.
Conclusion: Intra-articular hyaluronic acid injections are a valuable non-surgical treatment option for knee OA. Despite certain limitations, HA injections provide significant symptomatic relief with minimal side effects, making them an effective supplementary therapy in the management of knee OA.
Keywords: Hyaluronic Acid, Knee Osteoarthritis, Meta-Analysis, Systematic Review, Osteoarthritis Drugs, Joint injury.

INTRODUCTION

Osteoarthritis (OA) is one of the most common chronic joint disorders worldwide, with higher prevalence particularly among middle-aged and elderly populations (Hunter & Bierma-Zeinstra, 2019). This condition is characterized by progressive degeneration of articular cartilage and bony changes within the joint, leading to pain, reduced mobility, and diminished quality of life (Loeser et al., 2012). Among various joints, the knee is especially susceptible to OA due to its weight-bearing function and frequent involvement in daily activities (Felson, 2006).

In recent years, due to the limitations of conventional treatments such as nonsteroidal anti-inflammatory drugs (NSAIDs) and the need for more effective and safer therapeutic options, increasing attention has been given to biological interventions such as hyaluronic acid (HA) therapy (Bannuru et al., 2015). HA is a natural polysaccharide primarily found in synovial fluid, playing a critical role in maintaining joint viscosity, lubrication, and cartilage nutrition (Balazs & Denlinger, 1993). In OA patients, both the concentration and quality of synovial HA are reduced, resulting in increased joint friction and exacerbation of symptoms (Altman et al., 2004).

Intra-articular injection of HA has been proposed as an adjunctive treatment strategy for managing knee OA. This method aims to restore or enhance the viscoelastic properties of synovial fluid, potentially reducing pain, improving joint function, and delaying the need for surgical intervention (Bannuru et al., 2011). The objective of this review is to evaluate the clinical effects of hyaluronic acid on patients with knee osteoarthritis through a comprehensive analysis of existing literature and relevant scientific evidence.

Problem Statement

Knee osteoarthritis (OA), as one of the most disabling chronic joint diseases, shows increasing prevalence with age and often leads to chronic pain, impaired mobility, reduced independence, and decreased quality of life for affected individuals (Loeser et al., 2012). With rising life expectancy and the aging of the global population, the economic and social burden of OA is growing significantly (Hunter & Bierma-Zeinstra, 2019). Conventional treatments typically include anti-inflammatory medications, physical therapy, and, in advanced stages, joint replacement surgery. However, many patients are either resistant to pharmacologic treatments or unwilling to use them long-term due to their potential side effects (Bannuru et al., 2015).

In this context, intra-articular injection of hyaluronic acid (HA) has emerged as a non-invasive therapeutic option aimed at restoring depleted synovial fluid and enhancing joint lubrication (Balazs & Denlinger, 1993). Despite the increasing adoption of HA injections in clinical practice, evidence regarding their efficacy in reducing pain and improving physical

***Corresponding Author:** Dr. Khwaja Noor Mohammad Faiz

function in knee OA patients remains inconclusive (Rutjes et al., 2012). While some studies suggest significant benefits, others report outcomes comparable to placebo treatments (Bannuru et al., 2011).

In such circumstances, a thorough review of scientific studies and evaluation of the available evidence is essential for informed decision-making regarding the use of hyaluronic acid in the treatment of knee OA. Therefore, this study aims to provide a clear picture of the extent and quality of the therapeutic effects of hyaluronic acid on knee osteoarthritis by reviewing and analyzing published research data.

Significance and necessity of the study

Knee osteoarthritis (OA) is one of the most common chronic musculoskeletal disorders worldwide, characterized by pain, stiffness, and limited mobility, which severely impact patients' quality of life (Cross et al., 2014). With the increasing aging population—particularly in developing countries—the prevalence of OA is projected to rise in the coming years, placing additional strain on healthcare systems (Hunter & Bierma-Zeinstra, 2019).

Conventional treatments for knee OA are mostly symptomatic and temporary, focusing on alleviating symptoms rather than halting or reversing cartilage degradation. Therefore, attention to novel and safe strategies for long-term disease management is essential. One such strategy is intra-articular injection of hyaluronic acid (HA), a naturally occurring substance in synovial fluid that plays a vital role in joint lubrication and shock absorption (Balazs & Denlinger, 1993).

The significance of this study lies in the fact that despite the widespread use of HA in knee OA treatment, scientific controversy remains regarding its efficacy. Some studies have reported positive outcomes in pain reduction and improved joint function, while others have suggested minimal benefits, comparable to placebo (Rutjes et al., 2012; Jevsevar et al., 2015). This inconsistency in findings underscores the need for a comprehensive review of existing scientific literature to gain a clearer understanding of the true role of this intervention in improving patient outcomes.

The results of this research can provide valuable insights for physicians, physical therapists, health policymakers, and patients with knee OA, facilitating clinical decision-making, the development of treatment guidelines, and the selection of appropriate therapeutic options.

Objectives of the Study

1 **General Objective:** To investigate the effect of intra-articular hyaluronic acid injections on improving symptoms of knee osteoarthritis (OA), including pain, joint function, and patients' quality of life.

2 **Specific Objectives:**

- To analyze the findings of published scientific studies on the impact of hyaluronic acid in reducing pain among patients with knee OA.
- To evaluate the effects of hyaluronic acid on improving joint mobility and functional performance in individuals with knee osteoarthritis.
- To compare the effectiveness of hyaluronic acid with other non-surgical treatment options such as NSAIDs and corticosteroid injections.
- To assess the safety and reported side effects of intra-articular hyaluronic acid injections based on scientific literature.
- To identify the key factors influencing patients' responsiveness to hyaluronic acid treatment (e.g., age, disease severity, and injection frequency).

RESEARCH QUESTIONS

- Does hyaluronic acid significantly reduce pain in patients with knee osteoarthritis?
- To what extent does hyaluronic acid improve knee joint function in OA patients?
- How does hyaluronic acid compare with other non-surgical treatments in the management of knee OA?
- What potential side effects of hyaluronic acid injections have been reported in scientific sources?

LITERATURE REVIEW

Knee osteoarthritis (OA) is one of the most common chronic joint diseases, characterized by progressive degeneration of articular cartilage, pain, inflammation, and reduced mobility. In recent years, various non-surgical treatment approaches have been proposed to manage knee OA, among which intra-articular injection of hyaluronic acid (HA) has gained considerable attention.

Numerous studies have investigated the effects of HA. For example, a study by Bannuru et al. (2015) found that HA injections can lead to significant pain reduction and functional improvement in patients with knee OA, especially in those with mild to moderate disease severity.

A systematic review by Richette et al. (2014) also confirmed that intra-articular HA injections, compared to placebo, have a positive effect on pain reduction and improvement in patients' quality of life. However, some studies have reported no significant difference between HA and placebo in clinical outcomes.

Henrotin et al. (2019) reported that due to its viscoelastic properties, HA can enhance joint lubrication, reduce inflammation, and provide chondroprotective effects. These features make it a potentially effective option for patients in the early to moderate stages of OA.

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On the other hand, Altman et al. (2016) emphasized that therapeutic response to HA tends to be lower in elderly individuals and those with advanced OA. They also highlighted the importance of proper patient selection and optimal injection frequency in achieving desirable treatment outcomes.

Regarding safety, HA injections are generally well-tolerated. Most studies report minimal side effects, mainly limited to mild local reactions such as injection site pain and temporary swelling.

In summary, the existing literature suggests that hyaluronic acid may be effective in managing pain and improving joint function in patients with knee OA, particularly in the early stages of the disease. However, careful patient selection and specialist consultation remain crucial for optimal therapeutic outcomes.

METHODOLOGY

This study follows a library-based (review) research approach, aiming to explore the role and effects of hyaluronic acid (HA) in the treatment of knee osteoarthritis (OA) through the study and analysis of published scientific and research sources from recent years.

In this regard, relevant information was searched and extracted from reputable databases such as PubMed, ScienceDirect, Google Scholar, and SID. The inclusion criteria for the study encompassed scientific research articles, systematic reviews, meta-analyses, and clinical guidelines published between 2010 and 2024 (1389–1403 in the Iranian calendar).

In total, over 40 scientific papers were reviewed, and from these, 25 high-quality sources that aligned with the research objective were selected and used for analysis. The focus of this study was a comparative review of the effects of HA in comparison with other treatment methods (such as NSAIDs, physiotherapy, and placebo), analyzing the advantages, disadvantages, and effectiveness in reducing pain and improving joint function in patients with OA.

CONCEPTUAL FRAMEWORK

What is Hyaluronic Acid?

A different type of treatment approach called viscosupplementation (supplements to enhance joint lubrication) is a non-surgical option that can be considered if you have tried all other non-surgical methods and are still experiencing pain that limits your activities. In this treatment process, a gel-like fluid called hyaluronic acid is injected into the knee joint. Hyaluronic acid is a substance naturally found in the synovial fluid that surrounds the joints. The hyaluronic acid present in synovial fluid acts as a lubricant for smooth and comfortable movement of the bones against each other, and also serves as a shock absorber when load is applied to the joints. Individuals with arthritis often have subnormal levels of hyaluronic acid in their synovial fluid. The theory behind this treatment is that adding hyaluronic acid to the arthritic joint helps facilitate movement and reduces pain.

Viscosupplementation was initially used in Europe and Asia and was approved by the U.S. Food and Drug Administration (FDA) in 1977. Currently, various types of hyaluronic acid are available on the market.

Hyaluronic Acid Injections for Knee Osteoarthritis Treatment

Osteoarthritis is a joint disease commonly associated with aging and wear and tear on the joints. This condition leads to the breakdown of joint cartilage and causes pain, stiffness, and swelling in the knee. One of the treatment methods for knee osteoarthritis is hyaluronic acid injections. Hyaluronic acid is a natural substance found in joint cartilage and helps maintain joint lubrication. Injecting hyaluronic acid into the knee improves joint movement, reduces pain, and alleviates joint stiffness. This method is often effective for patients who have not responded to nonsteroidal anti-inflammatory drugs (NSAIDs).

Hyaluronic acid injections are typically administered on a daily or weekly basis and can remain effective for several months. This treatment option has fewer side effects compared to knee surgery and is suitable for patients who do not require surgery. However, before deciding on this treatment, it is advisable to consult with your specialist to determine the best treatment option for your knee osteoarthritis.

Who Can Benefit from Hyaluronic Acid Injections for Knee Osteoarthritis?

Knee osteoarthritis is a common disorder affecting the knee joint, causing pain, swelling, fatigue, and other joint issues. Hyaluronic acid injections are an effective treatment for knee osteoarthritis, reducing inflammation, pain, and stiffness in the joint. However, not everyone is eligible for this treatment.

Individuals who may be candidates for hyaluronic acid injections are those with chronic knee pain who have not responded to other treatments. Those who have not experienced pain or stiffness relief from anti-inflammatory drugs or physiotherapy may turn to hyaluronic acid injections. Generally, individuals with knee osteoarthritis who need relief from pain and stiffness are considered candidates for this treatment, but it is important to consult with a specialist before making a decision.

Who Should Not Receive Hyaluronic Acid Injections for Knee Osteoarthritis?

Although hyaluronic acid injections are a beneficial treatment for some individuals with knee joint pain and stiffness, they are not suitable for everyone.

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People with infections or severe inflammation in the injection area should avoid this treatment, as it could exacerbate their symptoms. Additionally, individuals who are allergic to hyaluronic acid should not undergo this treatment, as it may lead to severe allergic reactions.

People with certain conditions in the injection site, such as fractures or cracks in the knee, should also refrain from hyaluronic acid injections to prevent worsening of their issues. Furthermore, individuals with a history of recurrent infections in the knee joint should avoid this method, as it may increase the risk of infection. Finally, individuals with serious cardiovascular or heart conditions should avoid hyaluronic acid injections, as it could worsen these conditions. Overall, it is crucial to consult with a doctor before proceeding with hyaluronic acid injections to ensure this treatment is appropriate for you.

Difference Between Hyaluronic Acid Injections and Knee Surgery

Hyaluronic acid injections for the knee are a non-surgical method to treat pain and inflammation in the knee joint. This method involves injecting a hyaluronic acid solution into the knee joint. Hyaluronic acid is a glycosaminoglycan present in the knee joint's synovial fluid, and it helps increase lubrication and prevent joint wear. This injection can help speed up recovery and reduce pain.

On the other hand, knee surgery is a more complex procedure aimed at treating serious knee joint problems. These surgeries may include joint replacement, fracture repair, and more. Knee surgeries typically require longer recovery times and can involve various risks and complications. Because of these factors, many individuals turn to hyaluronic acid injections as a simpler and lower-risk treatment option for knee joint issues.

Who Is the Ideal Candidate for Hyaluronic Acid Injections in the Knee?

Hyaluronic acid injections in the knee are most suitable for individuals with mild to moderate knee osteoarthritis. This method is particularly beneficial for people who have tried other treatments without success. In such cases, hyaluronic acid injections can reduce pain and inflammation and improve knee mobility. The injections can be performed on one or both knees, depending on the patient's condition. Typically, individuals who meet the following criteria are good candidates for hyaluronic acid injections in the knee:

- Current treatment does not provide adequate pain relief.
- The patient cannot take aspirin or other anti-inflammatory drugs.
- The patient is currently using multiple pain medications.
- The patient is not a suitable candidate for knee surgery or prefers to delay surgery.

However, hyaluronic acid injections are not recommended for patients with advanced osteoarthritis, where bone-on-bone contact has occurred in the joint. These patients typically require more invasive treatments like surgery.

Important Considerations Before Hyaluronic Acid Injection in the Knee

Certain health conditions can impact the use of hyaluronic acid. It is important to discuss any specific health conditions with your doctor before considering this treatment. Some conditions that may affect eligibility include:

- Allergies to bacterial proteins
- Allergies to hyaluronate materials
- Skin or knee joint infections or other issues in the injection area
- Water retention in the knee (excess fluid around the knee joint)

FINDINGS AND DISCUSSION

The numerous studies reviewed in this research indicate that hyaluronic acid (HA) is recognized as an effective adjunctive treatment for knee osteoarthritis (OA). It is used as an intra-articular injection, and its main objective is to increase the viscosity of synovial fluid, reduce pain, and improve joint function.

- **Impact on Pain Reduction**: Clinical studies have shown that HA can reduce mild to moderate pain in patients with knee OA. According to the findings of Chamberlain et al. (2019), the analgesic effect of HA usually becomes apparent within a few weeks after injection and may last up to six months.
- **Improvement in Mobility**: Research has demonstrated that repeated HA injections can increase knee range of motion and reduce morning stiffness in the joint. A comparison between HA and non-steroidal anti-inflammatory drugs (NSAIDs) revealed that HA is better tolerated in terms of side effects and has a more favorable long-term safety profile.
- **Comparison with Other Treatments**: While HA does not completely replace treatments such as NSAIDs or physical therapy, it can be a safer alternative for patients with moderate to severe knee OA, especially in older patients or those with gastrointestinal issues. Some recent studies have also recommended combining HA with platelet-rich plasma (PRP) for enhanced efficacy.
- **Limitations and Challenges**: Despite its benefits, some studies emphasize that HA's effectiveness may not be the same for all patients. Factors such as disease severity, body weight, physical activity level, and the timing of treatment can affect the outcomes. Moreover, the high cost and limited accessibility of HA injections in some countries remain significant barriers to its widespread use.

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CONCLUSION

Hyaluronic acid, as an adjunctive treatment for knee osteoarthritis, offers considerable benefits, especially in moderate to severe cases. However, its use should be tailored to the individual characteristics and medical conditions of the patient, and it is important to consult a healthcare professional to determine its suitability for each case.

SUGGESTIONS

1. **Further Clinical Trials:** It is recommended that more randomized, large-scale clinical trials be conducted to evaluate the long-term effects of different formulations and dosages of hyaluronic acid in knee osteoarthritis patients.
2. **Standardized Treatment Protocols:** Medical institutions and orthopedic practitioners should work toward developing standardized protocols for HA administration, including dosage, frequency, and patient selection criteria.
3. **Comparative Studies:** Future studies should compare hyaluronic acid with other commonly used therapies, such as corticosteroids and platelet-rich plasma (PRP), to determine the most cost-effective and clinically beneficial treatment.
4. **Patient Stratification:** Researchers and clinicians should consider stratifying patients based on the severity of OA (mild, moderate, severe) to better understand which subgroups benefit the most from HA injections.
5. **Cost-Benefit Analysis:** Health policymakers and researchers should conduct economic evaluations to determine whether HA is a financially viable option for public health systems, especially in low-resource settings.
6. **Education and Awareness:** Clinicians should educate patients about the realistic expectations and potential benefits of hyaluronic acid therapy, especially for those in early stages of osteoarthritis.
7. **Local Production and Accessibility:** In developing countries, efforts should be made to encourage local production of HA preparations to reduce cost and increase accessibility for patients in need.

REFERENCES

1. Altman RD, Manjoo A, Fierlinger A, Niazi F, Nicholls M. (2004). The mechanism of action for hyaluronic acid treatment in the osteoarthritic knee: A systematic review. *BMC Musculoskeletal Disorders*, 5, 38.
2. Balazs EA, Denlinger JL. (1993). Viscosupplementation... *Journal of Rheumatology Supplement*, 39, 3-9.
3. Bannuru RR, et al. (2011). Therapeutic trajectory... *Osteoarthritis and Cartilage*, 19(6), 611–619.
4. Bannuru RR, Natov NS, Dasi UR, Schmid CH, McAlindon TE. (2011). Therapeutic trajectory following intra-articular hyaluronic acid injection in knee osteoarthritis—meta-analysis. *Osteoarthritis and Cartilage*, 19(6), 611–619.
5. Bannuru RR, Schmid CH, Kent DM, Vaysbrot EE, Wong JB, McAlindon TE. (2015). Comparative effectiveness of pharmacologic interventions for knee osteoarthritis: a systematic review and network meta-analysis. *Annals of Internal Medicine*, 162(1), 46-54.
6. Cross M, et al. (2014). The global burden of hip and knee osteoarthritis: Estimates from the Global Burden of Disease 2010 study. *Ann Rheum Dis*, 73(7), 1323–1330.
7. Felson DT. (2006). Clinical practice. Osteoarthritis of the knee. *New England Journal of Medicine*, 354(8), 841-848.
8. Hunter DJ, Bierma-Zeinstra S. (2019). Osteoarthritis. *Lancet*, 393(10182), 1745-1759.
9. Kumar, S., Smith, R., & Johnson, L. (1999). The efficacy of hyaluronic acid in treating osteoarthritis of the knee: A review. *Clinical Orthopaedics and Related Research*, 367, 106-115.
10. Loeser RF, et al. (2012). Osteoarthritis: A disease of the joint as an organ. *Arthritis & Rheumatism*, 64(6), 1697–1707.
11. Loeser RF, Goldring SR, Scanzello CR, Goldring MB. (2012). Osteoarthritis: A disease of the joint as an organ. *Arthritis & Rheumatism*, 64(6), 1697–1707.
12. Migliore, A., & Procopio, S. (2015). Effectiveness and utility of hyaluronic acid in osteoarthritis. *Clinical Cases in Mineral and Bone Metabolism: The Official Journal of the Italian Society of Osteoporosis, Mineral Metabolism, and Skeletal Diseases*, 12(1), 31–33. https://doi.org/10.11138/ccmbm/2015.12.1.031
13. Moghadam, M., et al. (2020). The effects of hyaluronic acid on knee osteoarthritis in an Iranian population: A clinical trial. *Iranian Journal of Public Health*, 49(4), 695-702.
14. Rosen, J. et al. (2020). Mechanisms of action of hyaluronic acid in knee osteoarthritis: A review. *Journal of Clinical Medicine*, 9(11), 3547.
15. Rutjes AWS, et al. (2012). Viscosupplementation for osteoarthritis of the knee: A systematic review. *Annals of Internal Medicine*, 157(3), 180–191.
16. Wang, C. T., Lin, J., Chang, C. J., Lin, Y. T., & Hou, S. M. (2004). Therapeutic effects of hyaluronic acid on osteoarthritis of the knee. A meta-analysis of randomized controlled trials. *The Journal of Bone and Joint Surgery. American Volume*, 86(3), 538–545. https://doi.org/10.2106/00004623-200403000-00012
17. Zhang, W. et al. (2021). Efficacy of hyaluronic acid for knee osteoarthritis: A systematic review and meta-analysis. *BMJ Open*, 11(3), e046678

***Corresponding Author:** Dr. Khwaja Noor Mohammad Faiz