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Original Research Article

The Prolonged Impact of Prolotherapy on Joint Well-Being in Osteoarthritis Individuals

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Abstract:

Over three years, this study evaluates the long-term efficacy and safety of prolotherapy using hypertonic dextrose in treating knee osteoarthritis. This observational study included 200 individuals with chronic knee pain characteristic of osteoarthritis. Participants received dextrose injections under ultrasound guidance, with the process meticulously detailed to ensure consistency. Annual X-rays and initial and final MRIs were performed to monitor changes in joint structure. Pain and functionality were assessed using the Visual Analogue Scale (VAS) and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). The results demonstrate sustained improvements in pain and joint functionality without serious adverse effects, suggesting that prolotherapy is a viable long-term treatment for managing symptoms of knee osteoarthritis. This study's focus on chronic conditions, without comparing to a control group, provides valuable insights into the standalone benefits of prolotherapy.

Introduction

Osteoarthritis (OA) is a prevalent degenerative joint disease that significantly impairs quality of life due to chronic pain and functional limitations. Traditional treatments for OA include pharmacological management, physical therapy, and, in severe cases, surgical interventions [1]. However, these approaches often provide temporary relief and can be associated with substantial side effects. In recent years, prolotherapy—a regenerative injection therapy using hypertonic dextrose—has emerged as a promising alternative, particularly for patients who do not respond adequately to conventional treatments [2].

Prolotherapy is hypothesized to facilitate the repair of connective tissue and stimulate natural healing processes by inducing a mild inflammatory response. This treatment approach has gained attention due to its potential to not only alleviate symptoms but also modify the underlying pathologies of joint degeneration [3]. Previous research has predominantly focused on short-term outcomes, leaving a significant gap in understanding the long-term efficacy and safety of prolotherapy in chronic OA management [4].

The current study is designed to address this gap by evaluating the outcomes of prolotherapy over three years, specifically focusing on patients with knee osteoarthritis. The primary objectives are to assess the sustained effectiveness of prolotherapy in reducing pain and improving joint function and to monitor any long-term adverse effects associated with the treatment. This study uniquely contributes to the existing literature by providing a detailed analysis of the injection process, specifying the timing of imaging assessments, and emphasizing the treatment's impact on chronic pain and joint health over an extended period.

By focusing exclusively on the effects of hypertonic dextrose injections without the comparison to a control group or alternative treatments such as saline injections, this study aims to isolate the benefits attributable directly to prolotherapy. The insights gained from this research will be critical in determining whether prolotherapy should be considered a mainstay treatment option for chronic osteoarthritis, particularly for those seeking non-surgical interventions.

Material and Methodology

Study Design: This study employed a longitudinal observational design over three years to evaluate the efficacy and safety of prolotherapy for knee osteoarthritis. The focus was on a detailed assessment of chronic pain and joint functionality without the influence of a control group.

Study Population: The study included 200 adults diagnosed with knee osteoarthritis based on the American Rheumatological Association criteria. The emphasis was on chronic pain patients, ensuring a diverse representation of osteoarthritis severity.

Intervention:

Participants received prolotherapy consisting of hypertonic dextrose injections. The injection process was meticulously documented: it involved cleaning the injection site with an antiseptic, using ultrasound guidance to precisely target the affected joint area, and administering the dextrose solution. The concentration of dextrose, volume, and specific injection sites were recorded for each session.

Imaging and Timing:

To track the progression of osteoarthritis and the effects of the treatment, X-ray imaging was conducted at baseline, and at the end of each year of the study. MRI was utilized at the beginning and after the study period to provide detailed insights into the structural changes within the joint. The specific times when these imaging studies were performed were noted to correlate them with the clinical outcomes.

Outcome Measures:

The primary outcomes measured were pain, assessed using the Visual Analogue Scale (VAS), and joint function, evaluated through the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). These measures were collected at baseline, annually during the follow-up, and at the study's conclusion.

Follow-Up and Monitoring:

Follow-up assessments were conducted annually to observe the long-term effects of the treatment. This approach helped in understanding the duration of pain relief and functional improvements over time.

Data Analysis:

Data were analyzed using descriptive statistics to quantify the improvements in pain and functionality. The study focused on individual patient outcomes to document the specific effects of prolotherapy without aggregating data into percentage changes, which are less illustrative of individual variations in response to treatment.

Results

Study Population and Follow-up:

Two hundred individuals with knee osteoarthritis were initially enrolled in the study. Over the three years, there was a dropout rate of 5%, resulting in a final sample size of 190 participants.

Intervention and Follow-up:

Prolotherapy was administered according to the predetermined protocol, with regular sessions conducted over the three years. Participants received annual booster injections to sustain the treatment effects.

Outcome Measures:

1. Pain Assessment (VAS):

- At baseline, the average VAS score was 6.5. Throughout the study, there was a consistent decrease in pain intensity, with the average score reducing to 4.9 at the three-year mark.

2. Joint Functionality (WOMAC Index):

- The WOMAC scores demonstrated significant improvements in joint functionality over time. At baseline, the average score was 60, which decreased to 40 at the end of the three years.

3. Imaging Studies:

- Findings revealed a slower progression of joint degeneration than expected for osteoarthritis. Some participants even exhibited minor improvements in joint space and cartilage thickness by the conclusion of the study.

Adverse Events:

No serious adverse events related to prolotherapy were reported throughout the study period. Minor and transient side effects, such as injection site pain, were consistent with the expected outcomes of the treatment.

Statistical Analysis:

Descriptive statistics were utilized to summarize the changes observed in pain intensity and joint functionality over the three years. These analyses confirmed the sustained improvements in both domains, supporting the efficacy of prolotherapy for knee osteoarthritis.

Table 1: Summary of Results Over Three-Year Period

Time Point	Total Participants	VAS Score (0-10)	WOMAC Score (0-100)	X-ray & MRI Findings	Adverse Events
Baseline	200	6.5	60	Typical OA features observed	None
Year 1	200	5.5	50	Slight improvement in joint space	Minor injection site pain
Year 2	195	5.0	45	Stable with minor improvement	Minor injection site pain
Year 3	190	4.9	40	Slow progression of OA, better than expected	Minor injection site pain

Key:

VAS Score: Visual Analogue Scale for pain, where a lower score indicates less pain.

WOMAC Score: Western Ontario and McMaster Universities Osteoarthritis Index, where a lower score indicates better joint functionality.

X-ray & MRI Findings: Imaging studies are used to assess changes in the joint structure over time.

Adverse Events: Any side effects or complications reported during the study period.

Discussion

This study aimed to evaluate the long-term efficacy and safety of prolotherapy in managing symptoms of knee osteoarthritis over three years. The findings suggest that prolotherapy with hypertonic dextrose significantly reduces pain and improves joint functionality, with effects sustained throughout the study duration. These outcomes are particularly notable given the chronic nature of osteoarthritis, where long-term symptom management can often be challenging [5].

Our results demonstrated a consistent decrease in pain intensity as measured by the Visual Analogue Scale (VAS) and an improvement in joint functionality as indicated by the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) [6]. These improvements were sustained over the three years, highlighting the potential of prolotherapy not only as a symptomatic treatment but also as a modality that may alter the disease trajectory. The imaging studies supported this, showing a slower progression of degenerative changes in the joints compared to typical expectations for osteoarthritis progression [7,8].

Chronic pain is a predominant symptom of osteoarthritis and a significant challenge in its management. The sustained pain reduction observed in this study underscores the role of prolotherapy in chronic pain alleviation [9]. By potentially initiating a healing response and improving joint stability, prolotherapy offers a valuable treatment alternative for patients who might otherwise rely on continuous pharmacological treatment, which can have undesirable side effects [10].

The safety profile observed in this study was favorable, with no serious adverse events reported. The minor and transient nature of the side effects, such as injection site pain, suggests that prolotherapy is a safe option for the long-term management of osteoarthritis [11]. This is particularly important for a patient population that may be dealing with multiple comorbidities and the cumulative burden of chronic medication use.While this study provides valuable insights into the long-term benefits of prolotherapy, it does have limitations. The absence of a control group limits the ability to compare these outcomes against other treatments or placebo effects. Future studies could incorporate a randomized controlled trial design to more rigorously assess the efficacy and safety of prolotherapy against standard care or placebo treatments. Additionally, investigating the optimal frequency and concentration of dextrose injections could further refine the application of prolotherapy, maximizing its benefits and tailoring the treatment to individual patient needs [12,13].

Conclusion

The findings from this study suggest that prolotherapy is an effective and safe treatment option for managing chronic pain and improving joint functionality in patients with knee osteoarthritis. Its ability to provide sustained benefits over an extended period makes it a compelling alternative to traditional treatments, particularly for those seeking non-surgical options. Further research is needed to fully establish its role within the broader context of osteoarthritis management and to optimize treatment protocols for diverse patient populations.

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