



COMPARISON OF PROLOTHERAPY AND DRY NEEDLING ON PAIN, DISABILITY, RANGE OF PASSIVE STRAIGHT LEG RAISING AND KINESIOPHOBIA IN PATIENT WITH CHRONIC SCIATIC PAIN

Dr. Muhammad Umar^{*1}, Dr Hira Jabeen², Dr. Waqas Ashraf Chaudhry³, Dr. Warda Shafique⁴

¹HOD, Department of Physical Therapy, Lahore College of Pharmaceutical Sciences

²Azra Naheed Medical College

³Minhaj University

⁴University of South Asia

 ***Corresponding Author:** Dr. Muhammad Umar, <https://orcid.org/0009-0007-7027-7899>, HOD, Department of Physical Therapy, Lahore College of Pharmaceutical Sciences
Email: druk0001@gmail.com

 **CONFLICT OF INTEREST**
None declared.

 **GRANT SUPPORT**
None declared.

 **FINANCIAL SUPPORT**
None Declared.

ABSTRACT

Background: Chronic sciatic pain can substantially affect pain, mobility, disability, and fear of movement. Prolotherapy and dry needling are used as interventional or adjunctive approaches for persistent musculoskeletal pain, but direct comparative evidence in chronic sciatica is limited.

Objective: To compare the effects of prolotherapy and dry needling on pain, disability, passive straight leg raise, and kinesiophobia in patients with chronic sciatic pain.

Methods: This single-blind randomized clinical trial recruited 40 adults aged 20–50 years with unilateral chronic sciatic pain from three hospitals in Lahore. Participants were allocated by a random-number generator to prolotherapy plus therapeutic ultrasound (n=20) or dry needling plus the same ultrasound protocol (n=20). Six intervention sessions were delivered at 15-day intervals. Outcomes were the Oswestry Disability Index (ODI), Tampa Scale of Kinesiophobia (TSK), Numeric Pain Rating Scale (NPRS), and passive straight leg raise (SLR). Paired-samples t tests assessed within-group change. Between-group differences in change scores were evaluated using independent-samples tests, and 95% confidence intervals were calculated from the available summary statistics.

Results: All 40 randomized participants completed follow-up and were analyzed. Both groups showed significant within-group improvement in ODI, TSK, NPRS, and SLR (all $p < 0.001$). Compared with dry needling, prolotherapy produced greater mean improvement in ODI (mean difference [MD] 3.23 points, 95% CI 1.28–5.18; $p = 0.002$), TSK (MD 3.57 points, 95% CI 0.36–6.78; $p = 0.031$), and SLR (MD 2.06°, 95% CI 0.64–3.48; $p = 0.006$). The between-group difference in NPRS improvement was not significant (MD 0.27 points, 95% CI –1.11 to 1.65; $p = 0.694$).

Conclusion: Both prolotherapy and dry needling, when combined with therapeutic ultrasound, were associated with improvement in pain, disability, kinesiophobia, and passive SLR. Prolotherapy showed larger improvements in disability, kinesiophobia, and SLR, while pain reduction was similar between groups. These findings should be interpreted in the context of the small sample and short-term trial design.

Keywords

Dry Needling; Kinesiophobia; Low Back Pain; Pain Measurement; Prolotherapy; Sciatica

Acknowledgement

The research team acknowledges the study participants and the clinical staff of Iqbal Mahmooda Hospital, Iffat Anwar Medical Complex, and Life Line Hospital, Lahore, for their cooperation during recruitment, intervention delivery, and outcome assessment.

Umar M et al. Short Title

Prolotherapy Versus Dry Needling for Chronic Sciatic Pain



INTRODUCTION

Low back pain remains the leading cause of disability worldwide, with a large and increasing global burden (1). Sciatic or lumbosacral radicular pain is characterized by pain radiating into one or more lumbar or sacral dermatomes and may coexist with neurological symptoms or functional impairment (2). Diagnosis is primarily clinical and may be supported by neurological examination, neurodynamic testing, and imaging when clinically indicated (2,3). Management of sciatica commonly begins with non-surgical care. Contemporary evidence indicates substantial heterogeneity in physiotherapy interventions and uncertainty about the magnitude and durability of their effects, while surgery can provide faster relief in selected patients with disc-related sciatica but its relative benefits diminish over longer follow-up (4,5). This variability has encouraged investigation of adjunctive approaches for persistent symptoms.

Dextrose prolotherapy is a regenerative injection approach used for chronic musculoskeletal pain. Systematic reviews suggest potential benefits for pain and function, although effects vary across conditions, injection protocols, comparators, and follow-up periods (6,7). Dry needling is also used for chronic low back pain and myofascial pain; pooled evidence suggests short-term pain reduction, while effects on disability are less consistent (8). A randomized trial in discogenic radiating low back pain reported that adding dry needling to standard physiotherapy improved pain and disability (9). Direct comparative evidence between prolotherapy and dry needling for chronic sciatic pain is limited. The objective of this study was therefore to compare their effects on pain, disability, passive straight leg raise, and kinesiophobia in patients with chronic sciatic pain. The primary comparative hypothesis was that the magnitude of improvement would differ between the two treatment groups.

MATERIALS AND METHODS

Study Design and Reporting

This was a single-blind, parallel-group randomized clinical trial. The manuscript was structured in accordance with CONSORT 2025 reporting principles for randomized trials (10).

Setting and Duration

Participants were recruited from the physiotherapy departments of Iqbal Mahmooda Hospital, Iffat Anwar Medical Complex, and Life Line Hospital, Lahore. The study was completed within six months after approval of the synopsis.

Participants

Adults aged 20–50 years of either sex were eligible if they had unilateral pain beginning in the low back and radiating to a lower limb, pain aggravated by lower-limb movement, restricted passive straight leg raise below 40°, and a clinical diagnosis supported by magnetic resonance imaging. Exclusion criteria were spinal infection, spinal cord injury, vertebral tumor or fracture, previous lumbar or intracranial surgery, bilateral radiating lower-limb pain, and pregnancy.

Sample Size and Recruitment

The calculated sample size was 40 participants, with 20 participants in each group. The EpiTools calculation for comparison of two means used expected means of 10 and 8, a variance of 5, 95% confidence, 80% power, and a two-sided test. Participants were enrolled using non-probability consecutive sampling.

Randomization

Eligible participants were randomized in a 1:1 ratio using a random-number generator and allocated to Group A or Group B. Twenty participants were assigned to each group. The trial was conducted as a single-blind study. Outcome assessment was performed by a physiotherapist from the participating hospitals with more than four years of clinical experience.

Interventions

Both groups received a conventional therapeutic ultrasound protocol before the group-specific intervention: 10 minutes at 3 MHz and 1.0 W/cm². Group A received prolotherapy plus the ultrasound protocol, and Group B received dry needling plus the same ultrasound protocol. Six treatment sessions were delivered at 15-day intervals, with post-treatment assessment after the intervention period. Participants were asked to maintain usual activities and to avoid additional study-prohibited interventions such as steroid treatment, taping, and other electrotherapy modalities during the trial.

Outcome Measures

Four outcomes were assessed before and after treatment. Disability was measured with the Oswestry Disability Index (ODI), a widely used low-back-specific disability measure (11). Kinesiophobia was measured with the Tampa Scale of Kinesiophobia (TSK), which has established psychometric support in musculoskeletal pain populations (12). Pain intensity was measured using the Numeric Pain Rating Scale (NPRS), a standard pain intensity measure in low back pain research (13). Passive straight leg raise (SLR) range was measured as a neurodynamic outcome; SLR has documented reliability in suspected lumbar radicular pain, although measurement error should be considered when interpreting small changes (14).



Statistical Analysis

Data were analyzed in SPSS version 25 using descriptive statistics, paired-samples t tests for within-group pre/post comparisons, and independent-samples t tests for between-group comparisons, with statistical significance set at $p < 0.05$. Ninety-five percent confidence intervals for within-group change and Welch independent-samples comparisons of change scores were calculated from the reported means, standard deviations, and group size ($n=20$ per group). Positive change values represent improvement: a reduction for ODI, TSK, and NPRS, and an increase for SLR.

Ethical Considerations

Ethical approval was obtained from the Ethical Committee of Riphah International University, Lahore, before commencement of the study. Written informed consent was obtained from all participants before enrollment.

RESULTS

Participant Flow

Forty-six patients were assessed for eligibility and 40 were randomized. Six patients did not proceed to randomization. All 20 participants allocated to each intervention completed follow-up and were included in the analysis, with no post-randomization loss to follow-up (Figure 1).

Table 1. Overall demographic characteristics of the study cohort (N=40)

Variable	Reported value
Age	Mean 25.95 years; range 21–50 years
Weight	67.70 $\pm$ 5.55 kg; range 58–76 kg
Height	166.90 $\pm$ 11.56 cm; range 152–190 cm
Body mass index	24.73 $\pm$ 4.43 kg/m ² ; range 18.80–32.50 kg/m ²

Values are presented as mean $\pm$ standard deviation and range where internally consistent summary statistics were available.

Within-Group Changes

Both groups improved significantly across all four outcomes. In Group A, mean improvement was 8.46 points in ODI, 13.70 points in TSK, 3.27 points in NPRS, and 4.16° in passive SLR. Corresponding improvements in Group B were 5.23 points, 10.13 points, 3.00 points, and 2.10°, respectively (Table 2).

Table 2. Within-group improvement from pre-treatment to post-treatment

Outcome	Group	Mean change	SD	95% CI	p value
ODI, points	Prolotherapy	8.46	3.60	6.78 to 10.14	<0.001
ODI, points	Dry needling	5.23	2.30	4.15 to 6.31	<0.001
TSK, points	Prolotherapy	13.70	5.70	11.03 to 16.37	<0.001
TSK, points	Dry needling	10.13	4.20	8.16 to 12.10	<0.001
NPRS, points	Prolotherapy	3.27	2.30	2.19 to 4.35	<0.001
NPRS, points	Dry needling	3.00	2.00	2.06 to 3.94	<0.001
SLR, degrees	Prolotherapy	4.16	2.40	3.04 to 5.28	<0.001
SLR, degrees	Dry needling	2.10	2.00	1.16 to 3.04	<0.001

CI, confidence interval; NPRS, Numeric Pain Rating Scale; ODI, Oswestry Disability Index; SLR, straight leg raise; TSK, Tampa Scale of Kinesiophobia. Positive values represent improvement. Confidence intervals and p values were calculated from the reported mean change, SD, and $n=20$ per group.

Between-Group Comparison of Change

The prolotherapy group had greater improvement than the dry-needling group in ODI, TSK, and SLR. The between-group difference in NPRS improvement was small and not statistically significant (Table 3).

Table 3. Between-group comparison of mean improvement

Outcome	Group A change	Group B change	Mean difference (95% CI)	p value
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Outcome	Group A change	Group B change	Mean difference (95% CI)	p value
ODI, points	8.46	5.23	3.23 (1.28 to 5.18)	0.002
TSK, points	13.70	10.13	3.57 (0.36 to 6.78)	0.031
NPRS, points	3.27	3.00	0.27 (-1.11 to 1.65)	0.694
SLR, degrees	4.16	2.10	2.06 (0.64 to 3.48)	0.006

Group A, prolotherapy plus ultrasound; Group B, dry needling plus ultrasound. Mean difference = Group A improvement – Group B improvement; positive values favor greater improvement with prolotherapy. Between-group statistics were calculated from the reported change-score summary data using Welch independent-samples *t* tests.

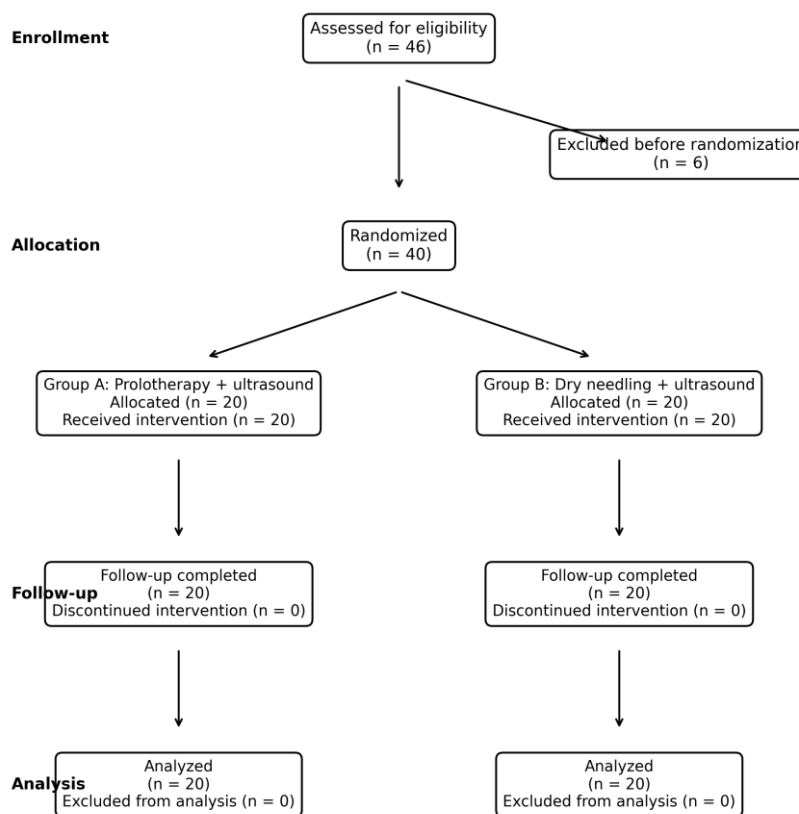


Figure 1. CONSORT-style participant flow through the randomized trial.

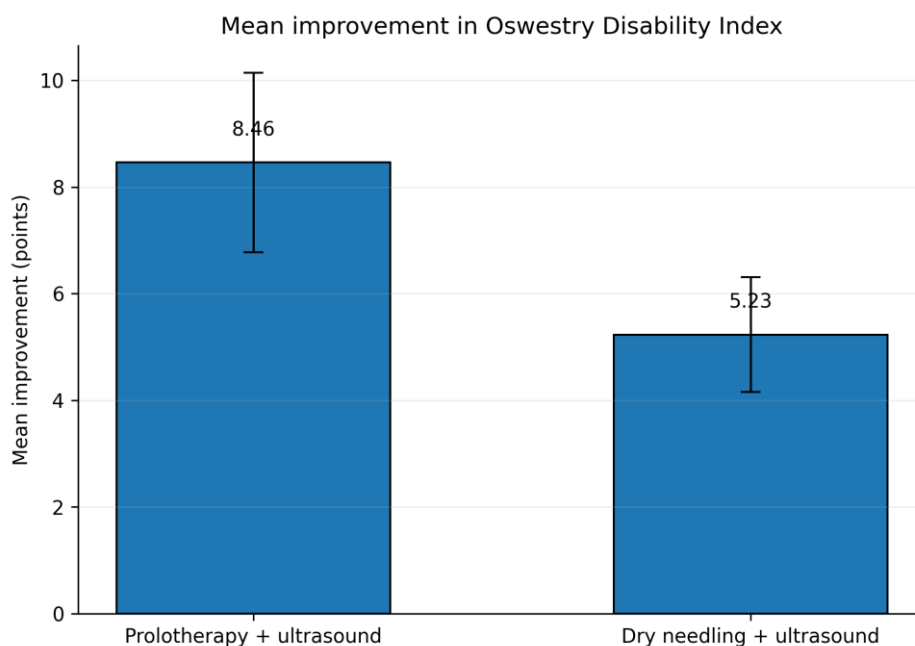


Figure 2. Mean improvement in Oswestry Disability Index by treatment group. Error bars show 95% confidence intervals calculated from the reported change-score standard deviations.

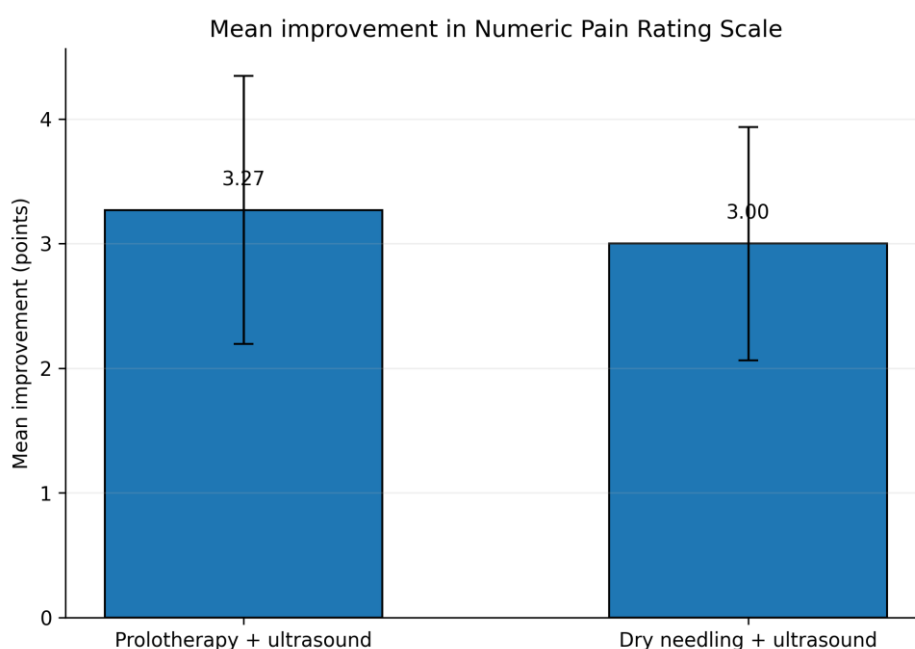


Figure 3. Mean improvement in Numeric Pain Rating Scale by treatment group. Error bars show 95% confidence intervals calculated from the reported change-score standard deviations.

DISCUSSION

The principal finding was that both treatment protocols were associated with statistically significant improvement in pain, disability, kinesiophobia, and passive SLR. When the reported change scores were compared directly, the prolotherapy group showed larger mean improvements in ODI, TSK, and SLR, whereas the magnitude of pain reduction measured by NPRS did not differ significantly between groups. The results therefore support improvement with both interventions but do not support a broad claim that prolotherapy was superior for every measured outcome. The observed functional findings are broadly compatible with reviews of dextrose prolotherapy showing potential benefit for chronic musculoskeletal pain, while emphasizing substantial heterogeneity in injection protocols, treated conditions, and comparators (6,15). A recent systematic review focused on chronic spinal pain likewise concluded that dextrose prolotherapy may reduce pain and improve function in selected chronic spinal conditions, but that treatment response depends on patient selection, concentration, route, and technique (7). These qualifications are important when interpreting the present trial because the sample was small and the protocol was specific to chronic sciatic pain.





Dry needling also produced significant within-group improvement. This is consistent with meta-analytic evidence supporting short-term pain reduction in chronic low back pain (8) and randomized evidence showing improved pain and functional outcomes with dry needling in chronic low back pain populations (16,17). In discogenic radiating low back pain, dry needling added to standard physiotherapy has also been associated with greater reductions in radiating pain and disability than standard therapy alone (9). Accordingly, the present findings should not be interpreted as absence of efficacy for dry needling; rather, both groups improved and the comparative effect varied by outcome. The SLR finding warrants particular caution. Although the recalculated between-group mean difference in SLR improvement was statistically significant, reliability research indicates that SLR range-of-motion measurements can have substantial measurement error between raters (14). The modest absolute difference observed here may therefore have limited clinical importance even though it reached statistical significance. Similarly, the between-group pain difference was only 0.27 NPRS points and was not statistically significant, indicating that pain relief was comparable between the two protocols.

The broader evidence base for sciatica remains heterogeneous. A randomized trial in lumbar radiculopathy conducted in Lahore demonstrated that structured physical-therapy-based care can improve pain and disability outcomes (18), while contemporary guideline reviews show variation in recommended pharmacological strategies and continued emphasis on individualized, nonpharmacological management (20). Diagnostic assessment also requires clinical–imaging correlation because imaging findings alone do not fully characterize symptomatic radiculopathy (21). Multimodal, person-centered management is therefore appropriate, with invasive or regenerative procedures considered within the overall clinical context rather than as stand-alone solutions (22). This trial had several strengths, including randomized allocation, complete post-randomization follow-up, use of multiple clinically relevant outcomes, and inclusion of both pain and psychosocial constructs. Important limitations were the small sample, single-blind design, pooled rather than group-specific baseline demographic reporting, short-term follow-up affected by the COVID-19 period, and occasional use of NSAIDs or opioid analgesics during the study. The intervention descriptions were sufficient to identify the treatment categories and ultrasound co-intervention but did not support detailed dose–response analysis. These limitations reduce precision and generalizability and warrant cautious interpretation of between-group differences. Future trials should use larger samples, prespecified primary outcomes, longer follow-up, fully standardized intervention protocols, and complete reporting of allocation concealment, blinding, adverse events, and clinically meaningful response thresholds. Such studies would clarify whether the observed differences in disability and kinesiophobia translate into durable clinical benefit.

CONCLUSION

In patients with chronic sciatic pain, both prolotherapy plus therapeutic ultrasound and dry needling plus therapeutic ultrasound were associated with significant improvements in pain, disability, kinesiophobia, and passive straight leg raise. Prolotherapy produced larger mean improvements in disability, kinesiophobia, and SLR, while the reduction in pain intensity did not differ significantly between groups. The findings suggest a potential comparative advantage for selected functional outcomes, but the small sample and short-term design limit definitive conclusions.

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