

Efficacy of Derivative Massage Combined with Infrared Radiation Therapy on Pain Reduction, Functional Capacity, and Quality of Life in Individuals with Knee Osteoarthritis

Monjur¹, Chinmayi¹, Sudeep¹, Sachin¹

Dr. Parameshwara M.N.²

¹Bachelor of Naturopathy and Yogic Sciences (BNYS) Students

²Associate Professor & HOD Dept of Research Methodology & Recent Advances

Tapovana Medical College of Naturopathy and Yogic Sciences (TMCNYS), Doddabathi, Davangere – 577566, Karnataka, India

(Affiliated to Rajiv Gandhi University of Health Sciences, Bengaluru)

Abstract

Background: Knee osteoarthritis is a chronic degenerative joint disease characterised by progressive cartilage loss, subchondral bone changes, and osteophyte formation, commonly presenting with pain, stiffness, and functional limitation. Evidence regarding the combined effect of derivative massage and infrared radiation therapy remains limited.

Objectives: To evaluate the effectiveness of derivative massage combined with infrared radiation therapy on pain, functional capacity, quality of life, and knee range of motion in individuals with knee osteoarthritis.

Materials and Methods: A single-group pre–post interventional study was conducted on 10 participants with clinically diagnosed knee osteoarthritis. The combined protocol of derivative massage and infrared radiation therapy was administered for 35–50 minutes per session, five sessions per week for 10 days (total 10 sessions). Outcomes were assessed using the British Pain Scale (BPS), WOMAC Index, KOOS, and goniometric knee range of motion (ROM) before and after the intervention. Data were analysed using paired-samples t-tests.

Results: Statistically significant improvements were observed across all measures: BPS pain scores decreased by 20.3% (5.90 ± 1.37 to 4.70 ± 1.64 ; $t(9) = 9.000$, $p < .001$, Cohen's $d = 2.85$); WOMAC scores decreased by 15.0% (49.40 ± 11.82 to 42.00 ± 14.73 ; $t(9) = 4.887$, $p < .001$, $d = 1.55$); KOOS scores increased by 14.4% (52.70 ± 9.84 to 60.30 ± 13.60 ; $t(9) = 5.019$, $p < .001$, $d = 1.59$); and knee ROM increased by 3.5% ($109.9 \pm 6.79^\circ$ to $113.7 \pm 8.23^\circ$; $t(9) = 5.225$, $p < .001$, $d = 1.65$).

Conclusion: Combined derivative massage and infrared radiation therapy produced significant short-term improvements in pain, function, quality of life, and knee mobility in individuals with knee osteoarthritis. Larger controlled trials are warranted to confirm these preliminary findings.

Keywords: *Knee osteoarthritis; derivative massage; infrared radiation therapy; pain; WOMAC; KOOS; range of motion; naturopathy*

1. Introduction

Knee osteoarthritis (OA) is a leading cause of pain and disability worldwide, characterised by progressive articular cartilage loss, subchondral bone remodelling, osteophyte formation, and variable synovial inflammation [1–3]. It imposes a substantial burden on mobility, independence, work capacity, and quality of life, and contributes significantly to years lived with disability [1,9,10].

Conservative management remains the first-line approach for most patients and includes education, weight management, exercise, pharmacological agents, and physical modalities [4,12]. Manual therapy (including massage) and thermal modalities such as infrared radiation have each been studied for symptom relief in musculoskeletal conditions [5,6]. Derivative massage aims to influence local and systemic circulation through rhythmic, reflex-based strokes, while infrared radiation produces controlled tissue heating, vasodilation, and reduction of muscle spasm [5,6]. Evidence for their combined use in knee OA is limited.

The present study evaluated a short combined protocol of derivative massage and infrared radiation therapy on pain, functional capacity, quality of life, and knee range of motion in individuals with knee osteoarthritis.

2. Aims and Objectives

Aim: To evaluate the efficacy of derivative massage combined with infrared radiation therapy on pain, functional capacity, and quality of life in individuals with knee osteoarthritis.

Objectives:

1. To assess change in pain intensity using the British Pain Scale (BPS).
2. To assess change in functional capacity using the WOMAC Index.
3. To assess change in quality of life using the KOOS.
4. To assess change in knee range of motion using goniometry.

3. Review of Literature

Knee OA is multifactorial, driven by age, mechanical loading, obesity, previous injury, and metabolic factors [2,7–9]. Conservative physical modalities remain central to guideline-recommended care [4,12]. Massage therapy has been associated with short-term reductions in osteoarthritic knee pain [60,62,65,66], while infrared and related photothermal approaches produce local heating, increased blood flow, and reduced muscle spasm, with mixed but generally favourable results when used as monotherapy [5,6].

Combining manual and thermal interventions is common in clinical practice and may offer additive benefits through complementary mechanisms of action.

4. Materials and Methods

4.1 Study Design and Setting

A single-group pre–post interventional study was conducted at Tapovana Medical College of Naturopathy and Yogic Sciences, Doddabathi, Davangere, Karnataka.

4.2 Participants

Ten participants (all male; mean age 42.6 ± 11.6 years) with clinically diagnosed knee osteoarthritis were enrolled. All completed the protocol with no dropouts.

Inclusion criteria:

- Confirmed clinical diagnosis of knee osteoarthritis
- Age 25–65 years, either sex
- Willingness to provide written informed consent

Exclusion criteria:

- Recent knee injury or surgery
- Severe joint deformity or inflammatory arthritis
- Neurological disorder affecting the lower limbs
- Concurrent physiotherapy or contraindication to infrared therapy

4.3 Ethical Considerations

The study received institutional ethics committee approval. Written informed consent was obtained from all participants. Participation was voluntary and confidentiality was maintained.

4.4 Intervention

Participants received a combined protocol of derivative massage (approximately 20–30 minutes) and infrared radiation therapy (approximately 15–20 minutes) per session. Sessions lasted 35–50 minutes in total and were delivered five times per week for 10 days (total of 10 sessions). Infrared therapy was typically applied before massage to enhance tissue pliability. Sessions were supervised and patient comfort and safety were monitored throughout.

4.5 Outcome Measures

British Pain Scale (BPS): Pain intensity assessment.

WOMAC Index: Validated 24-item questionnaire assessing pain, stiffness, and physical function in knee/hip OA; higher scores indicate greater disability.

KOOS: Knee-specific instrument with subscales for pain, symptoms, activities of daily living, sport/recreation, and quality of life; higher scores (0–100) indicate better status.

Knee Range of Motion (ROM): Measured by standard goniometry (degrees of flexion).

4.6 Statistical Analysis

Descriptive statistics (mean $\pm$ SD) were calculated. Pre- and post-intervention scores were compared using paired-samples t-tests. Effect size was expressed as Cohen's d. A p-value < 0.05 was considered statistically significant.

5. Results

All 10 participants completed the intervention with no reported adverse events.

5.1 Demographic Profile

Mean age was 42.6 ± 11.6 years; all participants were male. Mean BMI was 28.2 ± 1.2 kg/m². Affected side was right in 4, left in 4, and bilateral in 2 participants.

5.2 Primary Outcomes

Table 1 summarises the pre- and post-intervention comparisons.

Outcome	Pre (Mean $\pm$ SD)	Post (Mean $\pm$ SD)	% Change	t(9)	p	Cohen's d
BPS (Pain)	5.90 $\pm$ 1.37	4.70 $\pm$ 1.64	20.3% $\downarrow$	9.000	<.001	2.85
WOMAC	49.40 $\pm$ 11.82	42.00 $\pm$ 14.73	15.0% $\downarrow$	4.887	<.001	1.55
KOOS	52.70 $\pm$ 9.84	60.30 $\pm$ 13.60	14.4% $\uparrow$	5.019	<.001	1.59
Knee ROM (°)	109.9 $\pm$ 6.79	113.7 $\pm$ 8.23	3.5% $\uparrow$	5.225	<.001	1.65

Table 1. Comparison of pre- and post-intervention outcome measures (n = 10)

All four outcome measures showed highly statistically significant improvements with large to very large effect sizes.

6. Discussion

The combined protocol of derivative massage and infrared radiation therapy produced statistically significant short-term improvements in pain (BPS), functional disability (WOMAC), knee-related quality of life (KOOS), and knee range of motion in this sample of individuals with knee osteoarthritis. Effect sizes were large to very large across all measures.

These findings are consistent with prior evidence that massage can reduce osteoarthritic knee pain in the short term [60,62,65,66] and that thermal modalities contribute to local vasodilatation, reduced muscle

spasm, and improved tissue extensibility [5,6]. The magnitude of change observed with the combined protocol is compatible with an additive or synergistic effect, although the single-group design precludes formal attribution of benefit to either modality alone or to their interaction.

Limitations include the small sample size ($n = 10$), all-male sample, absence of a control or comparator group, short intervention and assessment period, lack of long-term follow-up, and single-centre design. Future randomised controlled trials with larger, more diverse samples and extended follow-up are needed.

Nevertheless, the consistency of improvement across four complementary measures, the absence of adverse events, and the practicality and low cost of the protocol support further investigation of combined derivative massage and infrared radiation as a conservative option for knee osteoarthritis.

7. Conclusion

Within the limitations of this single-group pre–post study, derivative massage combined with infrared radiation therapy significantly reduced pain and functional disability and improved quality of life and knee range of motion in individuals with knee osteoarthritis. The intervention was safe and well tolerated. Larger controlled trials are recommended to confirm these preliminary findings.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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