Case Report

Cryotherapy in the management of inflammatory flare of knee osteoarthritis: A case study

Sobiha Ramesh[1], Sudhakar Thangaraj[2], Tamilarasu T[3], Arya Raghu[4]

From, [1]Lecturer cum Medical Officer, Department of Psychology, [2]Assistant Professor cum Medical Officer, Department of Modern Medicine, [3]Assistant Professor cum Medical Officer, Department of Emergency medicine, [4]Assistant Professor cum Medical Officer, Department of Anatomy, JSS Institute of Naturopathy and Yogic sciences, coimbatore.

ABSTRACT

Knee osteoarthritis (OA) is a chronic, progressive musculoskeletal disorder and a major contributor to global disability, particularly among middle-aged and elderly populations. It is characterized by degeneration of articular cartilage, subchondral bone remodeling, osteophyte formation, and varying degrees of synovial inflammation. Inflammatory flares in knee OA represent episodic worsening of symptoms, including increased pain, joint swelling, warmth, and functional limitation. Cryotherapy is a non-invasive hydrotherapeutic intervention that involves the application of cold modalities such as ice packs, cold compresses, or cryogenic agents. Cryotherapy is increasingly utilized for its potential anti-inflammatory and analgesic properties. A 42-year-old female with a known case of bilateral knee OA presented with a six-month history of worsening of the symptoms. Clinical examinations revealed bilateral periarticular swelling, increased local temperature, and restricted functional mobility suggestive of an inflammatory flare of OA. The patient underwent localized cryotherapy for 15 minutes, twice daily for seven consecutive days. Pain intensity was assessed using the Visual Analog Scale (VAS), joint swelling was measured circumferentially in centimeters (girth measurement), and functional status was evaluated using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). After intervention, the patient demonstrated a marked reduction in pain intensity, decreased joint swelling, and significant improvement in functional ability. The patient was able to perform daily activities with reduced discomfort. This study showed that short-term cryotherapy may be an effective supportive intervention in reducing pain, swelling, and functional impairment during inflammatory flares of knee OA. However, further studies with larger sample sizes and objective diagnostic confirmation are required to substantiate these findings.

Key words: Osteoarthritis, Knee, Cryotherapy, Case Reports, Visual Analog Scale.

Osteoarthritis (OA) of the knee is a chronic, progressive musculoskeletal disorder and a major contributor to global disability, particularly among middle-aged and elderly populations. It is characterized by degeneration of articular cartilage, subchondral bone remodeling, osteophyte formation, and varying degrees of synovial inflammation. Epidemiological data suggest that approximately 10% of individuals aged 60 years and above are affected by symptomatic knee OA, making it a significant public health concern worldwide [1].

Traditionally, OA has been described as a degenerative joint disease; however, emerging evidence indicates that synovitis - inflammation of the synovial membrane- has been increasingly recognized as a key pathological feature associated with pain and disease progression in knee OA. Elevated tissue temperature, increased blood flow, and heightened inflammatory mediator activity contribute to symptom exacerbation [2,3].

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Inflammatory flares in knee OA represent episodic worsening of symptoms, including increased pain, joint swelling, warmth, and functional limitation. These flares are often associated with synovial activation and effusion, leading to acute disability and reduced participation in daily activities [4,5]. The management of such exacerbations typically involves pharmacological interventions such as non-steroidal anti-inflammatory drugs (NSAIDs) and analgesics. However, prolonged use of these medications is associated with potential adverse effects, thereby necessitating the exploration of safer, non-pharmacological alternatives. Cryotherapy, commonly referred to as cold therapy, is a non-invasive hydrotherapeutic intervention in musculoskeletal and rehabilitative medicine. It involves the application of cold modalities such as ice packs, cold compresses, or cryogenic agents to reduce tissue temperature. The physiological effects of cryotherapy include vasoconstriction, decreased metabolic activity, reduced nerve conduction velocity, and modulation

Correspondence to: Dr. Tamilarasu. T, Department of Emergency Medicine, JSS Institute of Naturopathy and Yogic sciences, coimbatore.

Email: tamilarasumoorthy@gmail.com

of inflammatory mediators. These mechanisms collectively contribute to analgesia, reduction of edema, and suppression of inflammatory responses [6,7]. Despite its safe, cost-effective, easily accessible modality, there is a relative paucity of well-documented case-based evidence focusing specifically on the role of cryotherapy during inflammatory flares of knee OA. Most existing studies evaluate chronic symptom management rather than acute exacerbations, creating a gap in the literature regarding its immediate therapeutic impact during flare-ups.

Therefore, the present case study aims to evaluate the effectiveness of short-term localized cryotherapy in managing an inflammatory flare of knee OA. The study focuses on assessing changes in pain intensity, joint swelling, and functional status using validated outcome measures.

CASE PRESENTATION

A 42-year-old female with a body mass index (BMI) of 30.5 kg/m^2 (Height -167 cm, Weight - 85 kg) presented to the outpatient department with complaints of bilateral knee pain and swelling with a known diagnosis of bilateral knee OA for the past two years. Confirmation was done with the previous X-ray report, which showed reduced joint space and osteophyte formation in both knees. The patient reported a recent exacerbation of symptoms characterized by increased pain intensity, joint swelling, stiffness, and difficulty in performing routine daily activities such as walking, squatting, prolonged standing, and stair climbing for the past six months. The symptoms were more pronounced in the morning and after periods of inactivity, with partial relief on rest. The patient was not on any regular medication or treatment for OA for the past 2 years.

On physical examination, both knees revealed periarticular swelling, increased local temperature, and tenderness on palpation along the joint line. Mild joint effusion was clinically evident. The range of motion in both knees was reduced due to pain and stiffness. Crepitus was noted during active movement. No ligamentous instability or deformity was observed. Based on the clinical presentation of increased pain, swelling, warmth, and reduced function, a diagnosis of an inflammatory flare of bilateral knee OA was considered. Her menstrual history was Normal. There was no history of recent trauma, fever, systemic illness, or involvement of other joints. The patient had no significant comorbidities such as diabetes mellitus, hypertension, hypothyroidism, or autoimmune disorders.

Baseline assessments were performed before intervention. Pain intensity was evaluated using the Visual Analog Scale (VAS). Joint swelling was assessed using circumferential girth measurement at the level of the mid-patella. Functional status was evaluated using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). As acute exacerbation is more confined to local changes than to systemic ones, blood parameters are not a reliable means of detecting the change.

Acute exacerbation is considered for the current study, and the patient underwent cryotherapy treatment for one week to reduce those flares. Informed consent was obtained before initiation of therapy. After the intervention period, the patient underwent regular yoga and naturopathy treatments for OA and weight loss. Patient was advised to do some regular knee strengthening exercises, yoga, postural corrections, and to add more fruits and vegetables to the diet.

Intervention

Following baseline assessment, cryotherapy was administered using crushed ice wrapped in a clean cotton cloth to ensure uniform cooling while preventing direct skin injury. The cold pack was applied locally over the anterior aspect of both knee joints, covering the periarticular region, including the suprapatellar, medial, and lateral joint line areas. Each session lasted for 15 minutes with careful monitoring to avoid adverse effects such as excessive numbness, discomfort, or skin irritation.

The intervention was delivered twice daily, once in the morning and once in the evening, for a total duration of seven consecutive days. The patient was positioned comfortably in a supine or long-sitting position with the knees slightly flexed to facilitate optimal exposure and relaxation of the joint structures during application. The patient was also instructed not to use any concurrent pharmacological analgesics or other physical modalities during the treatment period, to isolate the effect of cryotherapy.

RESULTS

Following a 7-day cryotherapy intervention, the patient demonstrated marked clinical improvement across all evaluated parameters (Table 1). This showed a substantial reduction in pain intensity, periarticular edema in both knees, and an increase in the functional status. The patient also reported subjective improvement in performing daily activities, including walking, sitting, standing, and stair climbing, with reduced discomfort and increased ease. No reported adverse events, such as skin irritation or hypersensitivity reactions, were observed during the intervention period, and the patient demonstrated good compliance and tolerance to the therapy.

Table 1: Clinical Outcome Measures Before and After Cryotherapy

Outcome Measure	Pre-Intervention	Post-Intervention
VAS (Pain)	8/10	3/10
Girth (Left Knee)	39.5 cm	35.5 cm
Girth (Right Knee)	38 cm	35 cm
WOMAC Score	80	42

DISCUSSION

The result of this study demonstrated that localized cryotherapy for one week was associated with substantial reductions in pain intensity, joint swelling, and functional impairment, and can bring significant clinical and subjective improvement in a patient experiencing an inflammatory flare of knee OA. A Cochrane database review reported that cold applications may reduce joint swelling and improve functional parameters such as muscle strength and range of motion [8]. Studies have shown that inflammatory mediators such as interleukin-1β (IL-1β), interleukin-6 (IL-6), tumor necrosis factor-α (TNF-α), and prostaglandin E2 (PGE2) are elevated in osteoarthritic joints and correlate with pain severity and structural progression. Local cold application significantly reduced intra-articular levels of those inflammatory mediators, suggesting a direct anti-inflammatory effect [9,10].

Another study has shown that cold application over the injured area reduces blood flow to the affected tissues, which limits the extravasation of plasma proteins and inflammatory mediators like leucocytes, granulocytes, and macrophages into the interstitial space, which contributes to the reduction of edema and joint swelling. Additionally, reduced tissue temperature leads to a decrease in cellular metabolic rate, thereby attenuating the enzymatic activity involved in inflammatory processes and limiting secondary tissue damage [11].

Silva et al. showed that local cryotherapy increases the excitability threshold of the sensory neurons by decreasing the neuronal metabolism and sodium-potassium (Na+/K+) pump activity, which in turn reduces the nerve conduction velocity, causing analgesia. Besides, the effects associated with the reduction of the inflammatory and edematous process also contribute to lower sensitization of the nociceptors in the tissue involved in the pathological and painful process [12]. These findings validated the analgesic and anti-inflammatory effects of local cold applications not only in chronic OA conditions but also in acute conditions associated with symptom exacerbation.

However, this study provided a clinically relevant, real-world observation of cryotherapy applied during an acute inflammatory flare, a scenario that is underrepresented in current literature. Since the current study was done in a single case, the results cannot be generalized to a larger population. The absence of a control group limits the ability to attribute the observed improvements solely to cryotherapy, as placebo effects or natural symptom fluctuation cannot be ruled out. The lack of objective imaging or laboratory investigations during the flare limits the ability to quantify the inflammatory process and its resolution. Additionally, functional assessment relied on patient-reported outcomes, which may be subject to response bias.

CONCLUSION

Short-term localized cryotherapy may be a supportive intervention in the management of inflammatory flares of knee OA. These findings suggest that cryotherapy can play a valuable role in alleviating acute symptoms and enhancing functional ability without the risks associated with pharmacological treatments.

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