

Case report



COMPLEMENTARY ULTRASOUND THERAPY IN THE MANAGEMENT OF OSTEOARTHRITIS-RELATED KNEE PAIN AND DYSFUNCTION: A CASE REPORT

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ABSTRACT:

Introduction: Ultrasound therapy is an evidence-based method for the treatment of knee joint osteoarthritis due to its analgesic, anti-inflammatory, and regeneration properties. In addition, phonophoresis has more potency to reduce pain and inflammation, combining therapeutic ultrasound with medical substances, penetrating the tissues. Complementary medicine implements essential oil-based formulations in physical therapy in order to optimize the effectiveness of the ultrasound modality.

Purpose: to assess the therapeutic effect of complementary ultrasound therapy in the management of osteoarthritis-related knee pain.

Materials and methods: *Materials:* A 55-year-old male suffering from osteoarthritis-related left knee joint pain, undergoing complementary ultrasound therapy at the University Center for Eastern Medicine. *Methods:* Ultrasound therapy with an essential oil-based cream formulation against joint and muscle pain.

Results: There is an improvement in symptoms on the second day, with a reduction in pain and swelling, and an increased range of motion in the knee joint in the short term, compared to conventional physical therapy.

Conclusion: Complementary ultrasound therapy using pure essential oil-based enriched formulation is a novel method to obtain synergy of essential oils, empowering the physiological and therapeutic action of ultrasound therapy.

Keywords: knee pain, complementary medicine, medical aromatherapy, essential oils,

INTRODUCTION

Osteoarthritis (OA) is a degenerative disease that causes osteophytic formations, subchondral sclerosis and erosions in the joint cartilage. It is also associated with biochemical and morphologic changes in the joint capsule. The knee is one of the most affected joints by osteoarthritic effects in the human skeleton, which puts patients with knee OA at a high risk of progressive functional disability and decreasing quality of life. The treatment encompasses pharmacological and nonpharmacological strategies [1]. Nonpharmacological methods include physical modalities, exercises, balneotherapy, etc. Ultrasound (US) is one of the most used physical agents in osteoarthritis-related knee pain management. There is evidence that the physiological action of therapeutic ultrasound is tailored to the pathogenetic and morphological changes of the knee joint, affected by osteoarthritis [2]. In order to achieve pain relief, joint and muscle relaxation and functional improvement, ultrasound therapy is upgraded to ultraphonophoresis (UPP) – a method for drug delivery by US. UPP combines the effects of US and medications in different pathways, such as conventional (non-steroid anti-inflammatory drug-based formulations) and nonconventional (essential oils or homeopathic remedy-based formulations) [3, 4]. Essential oils (EOs) have been used in human life for many years, but in recent years, new horizons have been opened with the development of medical aromatherapy [5].

PURPOSE:

To assess the therapeutic effect of complementary ultrasound therapy in the management of osteoarthritis-related knee pain.

MATERIALS AND METHODS

Materials: 55-year-old male suffering from osteoarthritis-related knee pain (2nd degree degenerative lesions according to the Kellgren–Lawrence scale), undergoing complementary ultrasound therapy at the University Center for Eastern Medicine. The patient has signed a consent for

the application of nonconventional methods for a beneficial impact on individual health. Regulation No. 7 of March 1, 2005, on the requirements for the activities of persons who practice nonconventional methods for a beneficial effect on individual health. State Gazette No. 22 of March 15, 2005, amended by State Gazette No. 24 of March 31, 2009.

Methods: The methodology of complementary ultrasound therapy includes the use of phonophoresis with pure essential oil-based cream, against joint and muscle pain containing *Mentha Canadensis*, *Rosmarinus officinalis*, *Copaifera Coriacea/Langsdorfii/ Officinalis/Reticulata*, *Mentha Piperita*, *Eucalyptus globulus*, *Malelaluca Alternifolia*, *Illicium verum*, *Mentha citrate*, *Gaultheria procumbens*, *Helichrysum Italicum*, *Tanacetum anuum*, etc. A small amount of this formulation (0,25 g) developed by a trusted company was mixed with an acoustic gel in a ratio 1:3, applied by BTL Electrotherapy and Ultrasound combination therapy device to the superior medial, inferior medial and lateral sides of the left knee joint in circular movements. The patellar, suprapatellar and infrapatellar regions were also included. Pulsed ultrasonic waves (DF 50%, 100 Hz) with a frequency of 1 MHz and power of 1.4 W/cm² were used. The duration was 7-10 minutes. The treatment course consisted of 5 consecutive days.

RESULTS AND DISCUSSION

Asking for the everyday patient's feedback, we figured out that at the beginning of the treatment, his first

sensation is cooling of the knee, lasting for 1-3 h, followed by warming with a feeling of relaxation of the joint. There was an improvement of symptoms on the second day, with a reduction in pain and swelling and an increased range of motion in the knee joint, as shown in Tables 1 and 2:

Table 1. Data gathered from VAS.

Day	1	2	3	4	5
VAS	9	5	4	3	2

Significant pain relief was reported on the second day, with the use of a combination of essential oils (*Mentha Canadensis*, *Rosmarinus officinalis*, *Copaifera Coriacea/Langsdorfii/ Officinalis/Reticulata*, *Mentha Piperita*, *Eucalyptus globulus*, *Malelaluca Alternifolia*, *Illicium verum*, *Mentha citrate*, *Gaultheria procumbens*, *Helichrysum Italicum*, *Tanacetum anuum*, etc). The essential oils in the preparation reduce the intensity of pain and have anti-inflammatory properties, due to the chemical content and broad-spectrum action [6]. Moreover, essential oils positively influence the regeneration of periarticular tissues due to epigenetic properties [7]. The chemical composition of the formula provides the analgesic effect through mechanisms inherent to *Copaifera*, *Tanacetum anuum*, *Gaultheria procumbens* [6, 8, 9]. *Gauteria procumbens* is one of the most adulterated essential oils, which is why the distillation processes, quality, and purity of the oil are of utmost importance for the therapeutic effect [10].

Table 2. Data gathered from the Knee circumference and ROM.

Day	1	2	3	4	5
Knee circumference (cm)	42,5	42	41,5	41,5	41
ROM	S: 0-5-90	S:0-5-110	S:0-0-120	S:0-0-120	S:0-0-130

The reduction of swelling and improvement in ROM could be explained by the direct chondroprotective, anti-inflammatory, and regenerative effects of therapeutic ultrasound [2]. Ultrasound therapy with essential oil-based formulation achieves a synergistic effect in the management of pain, inflammation, swelling and muscle imbalance. Based on previous clinical experience with a combination of topical use of phytopreparations and physical therapy in the treatment of chronic diseases, we decided to combine that pure essential oil-based enriched formula with conventional physical therapy in order to optimize the effectiveness in a "two or more in one" mode. By utilizing pure EO synergy, which is "attached" to the possibilities of ultrasound therapy, we obtained improvements in the short term with the use of a minimal amount

of the preparation compared to conventional physical therapy [11]. These outcomes correspond to those from other authors [12, 13].

CONCLUSION

Nonconventional approach in physical therapy represents a real opportunity to shorten the duration of the rehabilitation course. The implementation of EO in clinical practice opens up new horizons in modern medicine. Complementary ultrasound therapy using pure essential oil-based enriched formulation is a novel method to obtain synergy of essential oils and an empowered physiological and therapeutic action of ultrasound therapy, treating OA-related pain and dysfunction. Observing these results, we are encouraged to conduct further large studies.

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Please cite this article as: Grozdeva D, Velchev V. Complementary Ultrasound Therapy In the Management of Osteoarthritis-Related Knee Pain and Dysfunction: A Case Report. *J of IMAB*. 2025 Jan-Mar;32(1):6719-6721. [Crossref - <https://doi.org/10.5272/jimab.2026321.6719>]

Received: 02/09/2025; Published online: 26/01/2026



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