Original paper

The effect of local cryotherapy on knee pain

Wpływ krioterapii miejscowej na dolegliwości bólowe stawu kolanowego

Karolina Jędrzejczak-Pospiech, Karolina Iwińska, Adam R. Poliwczak

Department of Human Physiology, Medical University of Lodz, Lodz, Poland
Head of the Department: Adam R. Poliwczak MD, PhD

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Key words: pain, cryotherapy, gonarthrosis.

Słowa kluczowe: ból, krioterapia, gonartroza.

Abstract

Introduction: Gonarthrosis is the most common form of degenerative limb disease, manifested by pain, numbness, swelling and impaired function and action of movement in the knee joints. This condition occurs in adults around the age of 65 or older. The pathogenesis of the disease is multifactorial, including inflammatory processes that take into account the breakdown of articular cartilage, the formation of bone osteophytes, and sclerotization of the subchondral tissue. The risk factors include age, obesity, and diabetes. Cryotherapy is one of the methods of analysis in the instructions for gonarthrosis. One of the methods in the treatment of osteoarthritis is cryotherapy. Cryotherapy is a non-invasive procedure that uses cold air used locally or systemically. Cold treatments slow down blood circulation, reduce swelling and contribute to pain relief.
Aim of the research: To demonstrate the positive effect of local cryotherapy on reducing pain and swelling of the knee joints in patients with gonarthrosis.
Material and methods: The study involved 74 people, women and men aged 18–89, who underwent local cryotherapy for knee joints due to pain and joint swelling. The research method was an anonymous survey.
Results: Reduction of edema after the application of local cryotherapy treatments occurred in 91.1% of patients. 79.7% of the respondents noticed an improvement in the range of motion. 82.4% of the patients improved their knee mobility.
Conclusions: Cryotherapy as a single treatment or in combination with other treatments is an effective method of treating knee joint pain in patients with degenerative disease

Streszczenie

Wprowadzenie: Gonartroza jest najczęstszą postacią choroby zwyrodnieniowej kończyn, która objawia się bólem, drętwieniem, obrzękiem oraz upośledzeniem funkcji i ograniczeniem zakresu ruchu w stawach kolanowych. Schorzenie to występuje u osób dorosłych, w wieku ok. 65 lat lub starszych. Patogeneza choroby jest wieloczynnikowa, obejmuje m.in. procesy zapalne, które powodują uszkodzenie chrząstki stawowej, tworzenie kostnych osteofitów oraz sklerotyzację tkanki podchrzęstnej. Do czynników ryzyka zalicza się m.in. wiek, otyłość i cukrzycę. Krioterapia jest jedną z metod stosowanych w leczeniu choroby zwyrodnieniowej stawów. Jedną z technik stosowanych w leczeniu gonartrozy jest krioterapia. Krioterapia to nieinwazyjny zabieg, w którym wykorzystuje się zimne powietrze stosowane miejscowo lub ogólnoustrojowo. Zabiegi z wykorzystaniem zimna spowalniają krążenie krwi, zmniejszają obrzęk i przyczyniają się do złagodzenia dolegliwości bólowych.
Cel pracy: Stwierdzenie pozytywnego wpływu krioterapii miejscowej na zmniejszenie dolegliwości bólowych oraz obrzęków stawów kolanowych u pacjentów z gonartrozą.
Materiał i metody: W badaniu wzięły udział 74 osoby, kobiety i mężczyźni w wieku 18–89 lat, poddani zabiegowi krioterapii miejscowej na stawy kolanowe z powodu dolegliwości bólowych oraz obrzęków tych stawów. Metodą badawczą była anonimowa ankieta.
Wyniki: Zmniejszenie obrzęków po zastosowaniu zabiegów krioterapii miejscowej wystąpiło u 91,1% pacjentów. Poprawę zakresu ruchu zauważyło 79,7% badanych. U 82,4% badanych nastąpiła poprawa ruchomości całego kolana.
Wnioski: Krioterapia zarówno sama, jak i w połączeniu z innymi zabiegami stanowi skuteczną metodę leczenia dolegliwości bólowych stawów kolanowych u osób z chorobą zwyrodnieniową.

Introduction

Gonarthrosis is a chronic disease manifested by pain and impaired function and range of motion in the knee joints. According to current estimates, 25% of all people with osteoarthritis are patients suffering from knee osteoarthritis [1–4]. The underlying cause of this disease is multifactorial, and these factors include: age (over 60 years), overweight, obesity, injuries

and joint overload [5]. The diagnostic and therapeutic procedures recommended in this case by the European League Against Rheumatism (EULAR) include non-pharmacological (patient education through lifestyle changes, exercises), pharmacological (topical NSAIDs, capsaicin) and surgery [6] methods. Rehabilitation, depending on the patient's condition, is determined individually and, among others, includes laser therapy, ultrasound and cryotherapy [7].

Cryotherapy is applied in the treatment of gonarthrosis, resulting in a decrease in inflammation in the knee joint and pain associated with it [8].

Aim of the research

The aim of the study is to demonstrate the positive effect of local cryotherapy on the reduction of pain and swelling of the knee joints in patients undergoing this therapeutic method.

Material and methods

The study involved 74 people, women and men, patients of the Kraszewski Rehabilitation Center in Lodz, aged 18–89, subjected to local cryotherapy for knee joints due to pain and swelling of these joints.

The study included an anonymous questionnaire consisting of 15 questions, filled out by patients before a series of cryotherapy treatments (9 questions), during treatments (2 questions) and after the therapy (4 questions). The issues concerned the type of knee disorder, indication of the exact location of the discomfort, edema and pain, duration and intensity of knee pain. Patients have subjectively determined edema of the joint. Knee mobility was tested during the examination before rehabilitation.

After cryotherapy, patients were asked if there was a reduction in swelling (if it occured at the beginning of the treatment), if there was a reduction in pain and an improvement in joint mobility and range of mobility.

The Visual Analogue Scale (VAS) was used to determine the pain scale. The medical records of patients participating in the study were also analyzed.

Patients participating in the study underwent 10 local cryotherapy treatments for the knee joint, and then movement therapy – kinesitherapy. Forty-seven patients underwent a series of 10 local cryotherapy treatments for the knee joint. Two patients did not undergo all 10 procedures. Twenty-five patients underwent 25 local cryotherapy treatments in the day care ward and within the ZUS ward.

Cryotherapy apparatus based on liquid nitrogen – Kriopol R "Bryza" type R30 WER.1 – was used to perform local cryotherapy.

The results were prepared using Microsoft Office 2010.

Results

Osteoarthritis of the knees (44.5%) was the most common cause of movement restriction and pain in the study group. Other causes were meniscus injuries (13.6%), ligament injury or rupture (12.7%). Other conditions mentioned by the surveyed patients were: patellofemoral conflict (11.8%) and articular bursitis (8.2%). The smallest number of patients indicated Baker's cyst (2.7%) as the cause of pain.

The duration of pain in the knee, from the onset of pain symptoms to the start of cryotherapy, is shown in Figure 1. Pain lasting over 5 years occurred in 35 (47.3%) people. The subjects whose pain lasted longer than 5 years were patients diagnosed with osteoarthritis of the knee, attending cryotherapy several times. The least numerous group of patients consisted of the patients whose pain symptoms lasted less than 3 months (6.8%).

21.6% of patients estimated the period from onset of symptoms to institution of cryotherapy treatment as 3–12 months.

The location of the occurrence of pain in the knee joint is presented in Figure 2. Almost half of the examined patients (49.4%) indicated the medial part of the

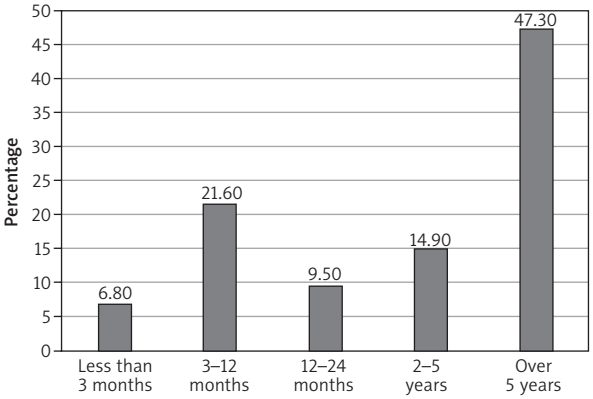

Figure 1. Duration of pain in the examined patients

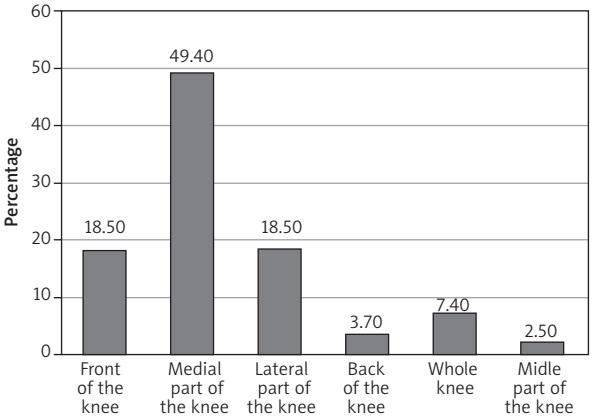

Figure 2. Localization of pain in the knee joint

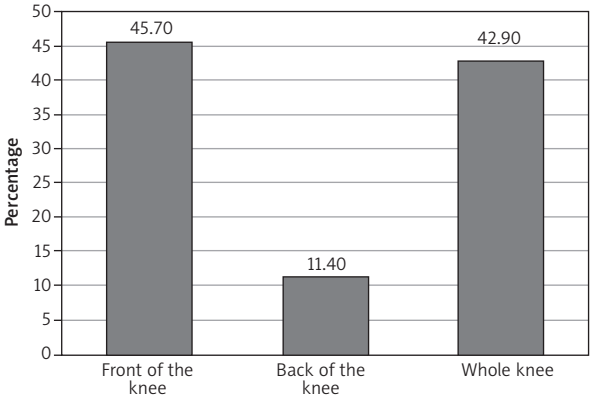

Figure 3. Occurrence of edema in the knee joint

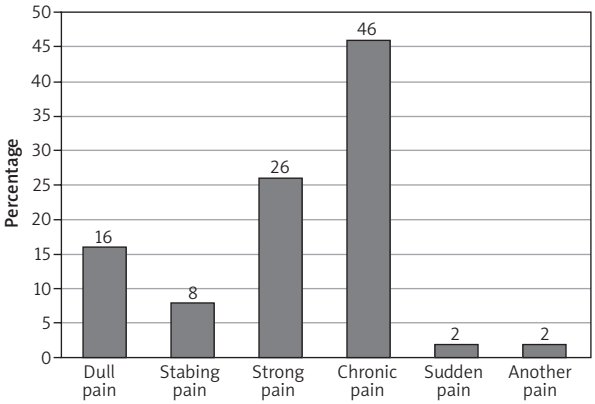

Figure 4. Type of felt pain in people with chronic knee joint pain

knee as the location of the pain. The fewest people indicated the center of the knee as a place of pain (2.5%). 18.5% of patients located pain in the lateral and anterior knee.

Figure 3 shows the occurrence of edema in the knee joint. Knee swelling occurred in 34 people, representing 45.9% of the respondents. Of these people, 45.7% of patients had edema on the anterior surface of the knee joint. Less than 43% (42.9%) of patients indicated the entire knee area as the place of pain. In 11.4%, pain occurred on the back of the knee (Figure 4).

Having analyzed the results of conducted tests, the reduction of edema after the application of local cryotherapy treatments occurred in 91.1% of patients. 79.7% of the respondents noticed an improvement in the range of movement. 82.4% of the patients improved their knee mobility.

The most common type of pain is chronic, continuous pain, indicated by 46% of respondents. Acute pain affects 26% of patients. Dull pain was indicated by 16% of respondents, while stabbing pain was reported by 8% of respondents.

Interpretation of the VAS results shows that pain after local cryotherapy was reduced. Pain before the application of local cryotherapy had an average level of 6.71 points, while after the application of cryotherapy it decreased to 4.06 (the difference was 2.66 points; $p < 0.05$).

Discussion

According to current knowledge, it is currently believed that the use of cold therapy improves the condition of patients. Cryotherapy causes up to a fourfold increase in blood flow through tissues [9, 10], and has local analgesic and anti-edema effects [11].

Cryotherapy is one of the most commonly recommended types of therapy, both as a single treatment and as a combined treatment. Its effectiveness is confirmed by scientific studies assessing the active range of motion after the application of cryotherapy and magnetotherapy. The above-mentioned procedures cause an improvement in the range of active motion in the knee joints, and also reduce pain on the VAS [12, 13].

The analysis of our results showed a reduction in pain in 94.6% of patients – the average improvement after surgery was 2.86 points on the VAS. A reduction in mean level of perceptible pain was obtained from 6.72 to 3.85 points. The range of motion and general mobility in the knee joint also improved significantly in 79.7% and 82.4% of respondents, respectively. Similar results were obtained in the study of Kopacz *et al.*, who assessed the effect of local cryotherapy on ailments related to knee osteoarthritis. Among others, the level of pain was measured using the VAS and range of knee joint mobility. After a series of local cryotherapy treatments, significant pain reduction was noticed. The range of motion in the knee joint also improved [14].

These observations are also consistent with the results obtained by Woszczak *et al.* They found a statistically significant reduction of pain based on the VAS and an increase in the range of motion in the knee joints in people with degeneration of joints after using local cryotherapy [15].

In our study, based on changes in the level of pain on the VAS, it was found that in people with chronic knee joint pain, cryotherapy is less effective than in patients undergoing acute surgery. The decrease in the level of ailments also did not depend on the duration of chronic ailments. This is in line with the research of Zając *et al.*, who did not prove the relationship between the duration of the disease and the scale of pain [16]. On the other hand, Klimek-Piskorz and Szymura found that comprehensive sanatorium treatment, including laser therapy, cryotherapy and mud wraps, contributes to the improvement of the range of motion in the knee joint and reduction of pain symptoms measured by the VAS [17].

Conclusions

The obtained research results confirm earlier reports that the use of cryotherapy, both separately and

in combination with other procedures, is an effective method of treating knee joint pain in patients with degenerative disease. It significantly reduces these ailments and improves the range of motion and general mobility in people with gonarthrosis.

Conflict of interest

The authors declare no conflict of interest.

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Address for correspondence:

Dr **Karolina Jędrzejczak-Pospiech**
Department of Human Physiology
Medical University of Lodz
ul. Narutowicza 60, 90-136 Lodz, Poland
Phone: +48 42 272 53 10
E-mail: karolina.jedrzejczak-pospiech@umed.lodz.pl