

Percutaneous cryoanalgesia in pain management: a case-series

Martina Bellini, Massimo Barbieri

Pain Management Unit, San Carlo Clinic, Paderno Dugnano (MI), Italy

Abstract

Background: Cryoanalgesia, also known as cryoneuroablation or cryoneurolysis, is a specialized technique for providing long-term pain relief.

Methods: There are presented retrospective data on pain relief and changes in function after cryoanalgesia techniques: we describe the effect of this procedure on articular facet syndromes, sacroiliac pain and knee pain. We reviewed records of 18 patients with articular lumbar facet pain, knee pain and sacroiliac pain.

Results: Both the visual analog scale and the Patient's global impression of change scale showed an increase in patients' satisfaction already at 1 month after cryoablation, with the best scores after three months. Only three individuals displayed a worse condition than at the first month.

Conclusion: The majority of patients experienced a clinically relevant degree of pain relief and improved function following percutaneous cryoanalgesia.

Key words: pain, chronic; pain, treatment, invasive; pain, treatment, percutaneous cryoanalgesia; pain, treatment, outcome

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Cryoanalgesia, that is the use of low temperatures to provide analgesia, is a pain management technique that can be applied to a variety of painful situations [1]. It is a method of relieving pain, transited by sensory nerves, by freezing the affected nerve branches, involved in conduction of the pain-related impulsion. The procedure is used for the treatment of various intractable pains and involves the precise location and freezing of the nerves associated with the pain. Pain relief is almost immediate and the block is completely reversible. Pain control is achieved by destroying or blocking the nerve ending that caused the patients' pain.

However, even though the nerve conduction is interrupted by the freezing process, the nerve cells remain intact. This allows the nerve to regenerate and regain its normal function over time. The majority of patients are able to resume a full activity level the next day. The basic principle involves the accurate positioning of the cryoprobe into the affected nerve branch and applying extreme cold.

Cryoanalgesia can be utilized for treating small well localized lesions of nerves [2], perineal pain, lower extremity

pain, post-herpetic neuralgia [3], and facial and cranial pain. It has also been used to obtain pain relief in biomechanical pain syndromes including lumbar [4, 5] or cervical facet syndromes [6], and coccygodynia, and to treat post-surgical pain [7]. The most common use for cryoanalgesia for lower back pain is the long term treatment of lumbar facet pathology [1–7]. Although sacroiliac joint pain is treated frequently with these kinds of techniques, treatment of knee pain is less common. The benefits of cryoanalgesia include long term pain relief, reversible nerve block, reduction in drug usage post-operatively and the ability to repeat the procedure. The treatment is usually performed after a diagnostic procedure involving local anaesthetic and a cortisone derivative has shown at least a temporary relief of symptoms. Actually the attention is focused on the efficacy of cryoanalgesia in decreasing pain after thoracotomy surgery [8, 9].

In this case-series, we describe the effect of percutaneous cryoanalgesia on articular facet syndromes, sacroiliac pain and knee pain.

METHODS

Our cohort consists of 18 patients who received cryoanalgesia at the San Carlo Clinic of Paderno Dugnano (Milan). The common cause of pain was articular lumbar facet ($n = 4$), followed by knee pain in those having undergone knee arthroplasty ($n = 4$), and sacroiliac pain ($n = 2$). The patients were more than 18 years old, with pain for lasting more than 3 months. Their pain had been unrelieved by analgesics and physical therapy, and had to be graded higher than 3 on a 10 visual analog scale (VAS). The patients also failed the traditional radiofrequency techniques. The criteria of exclusion were as follows: pain only on some occasions, previous cryotherapy; pregnancy; psychiatric disease that could interfere with a patient's adequate response to the result of the procedure; history of adverse reaction to lidocaine or bupivacaine.

Facet joint pain is often considered a biomechanical pain, typically made worse on movement, particularly with hyperextension. These patients often fail a physical therapy program as the therapy aggravates the pain. We froze only those at the most symptomatic levels (10 of 12 median branch, 2 of 12 median (dorsal rami). Regarding sacroiliac pain, patients claimed to experience pain down the leg in a radicular pattern.

The treatment panel was similar for all our patients: pain was treated by commonly used analgesics and anti-inflammatory drugs, i.e. paracetamol, tramadol and ibuprofen. Only one was treated with morphine. No patients with diabetes were enrolled. The following post-operative complications were excluded: pain in the area where the needle was inserted; temporary numbness or weakness in one or both legs; bleeding in the injection area; infection in the injection area; nerve damage; paralysis, stroke and even death [1].

Cryoanalgesia means of a cryogenic probe and direct fluoroscopy guidance [1]. A local anaesthetic is used in this procedure to numb the skin and underlying tissues. A catheter is then inserted into this area. A cryoprobe is threaded through the catheter. Once the specific nerve area is identified, the freezing process begins. This can take 2-3 minutes and may be repeated in order to cover one's pain. The procedure involves the application of extreme cold to specific

tissues in the area and is targeted at large sensory nerves and surrounding tissues. The probe is inserted using a thermal shield to minimize soft tissue affection.

Results are obtained with a visual analog scale VAS [10] evaluation and the Patients' global impression of change (PGIC) scale [11]. The patients underwent a 4-month follow up.

RESULTS

The median age was 60 ± 26 years. Two patients were men and 16 were women. All patients were Caucasian.

The visual analog scale scores are shown in Table 1.

All patients were satisfied at 1 month after cryoablation, with an evaluation of "moderately better" on the PGIC scale. 83.3% of the patients (15 of 18) described the change in activity limitations, symptoms, emotions and overall quality of life from 5 (moderately better) to 6 (better). Only two patients, treated for articular lumbar facet, and one treated for knee pain, displayed a worse condition than the first month ("almost the same", 2 PGIC point) and did not change their score. The best scores were reached at the third month: namely, a great deal better, and a considerable improvement that had made all the difference. At 4 months, we recorded a decrease in the score from 7 to 6, which means "better", namely a definite improvement that had made a real and worthwhile difference. All the scores are shown in Table 2.

DISCUSSION

Cryoanalgesia involves the technique of blocking peripheral nerve endings through freezing. It is an interventional pain therapy that seems less common than newer techniques such as pulsed radiofrequency ablation [12]. Brechner et al. [13] have studied the effects of percutaneous cryoneuroablation of the lumbar facet in patients with neck and lower back pain: although there was 70% pain relief after 1 hour, the relief lasted 1 week and by 3 months had returned to the baseline.

Lloyd et al. [14] and Evans et al. [15] used cryoanalgesia to treat the sacral nerve roots in patients with intractable sciatica and perineal pain. Ross et al. [16] described 23 patients with complete, but only short term relief from lumbar facet blocks: 21 had complete relief for a follow up

Table 1. Visual Analog Scale (VAS) values. Mean \pm SD

	Basal condition	1 month	2 months	3 months	4 months
Facet	8 ± 1	5 ± 1	4 ± 1	2 ± 1	4 ± 1
Knee	8 ± 1	5 ± 1	4 ± 2	2 ± 2	4 ± 2
Sacroiliac	8 ± 2	5 ± 0	4 ± 1	2 ± 0	4 ± 0
Total	8 ± 1	5 ± 1	4 ± 1	2 ± 1	4 ± 1
P value	< 0.0001				

Table 2. Patient's global impression of change (PGIC) scale. Mean \pm SD

	1 month	2 months	3 months	4 months
Facet	5 \pm 1	6 \pm 1	7 \pm 1	6 \pm 1
Knee	5 \pm 0	6 \pm 2	7 \pm 2	6 \pm 2
Sacroiliac	5 \pm 1	6 \pm 0	7 \pm 1	6 \pm 0
Total	5 \pm 1	6 \pm 1	7 \pm 1	6 \pm 1

1: no change, 2: almost the same, 3: a little better, 4: somewhat better, 5: moderately better, 6: better, 7: a great deal better

of 6 months to two years. Two patients had a return of pain six to eight months later.

Schuster et al. [17] described 52 patients followed up for a 13 month period; 47 had significant relief of lower back pain after cryoneuroablation, while only one patient had a repeat cryoanalgesia when the pain recurred after a 9-month pain free period. Regarding knee pain, although it is possible to find references about cold therapy, there are no references about cryoanalgesia for the management of this type of pain [18]. Moreover, Trescot [1] declared that sensation to the joint is expected to return in two to six months as the nerve regenerates. Our research showed a significant, favorable change score of 5–7, with a 2 point change from their last reported score considered significant. The best outcome was shown in the third month, with a 2 point change compared with the 1 month score.

Our research is limited both by the small number of patients and the limited follow up period. The patients reported pain relief for several months following this procedure. While some patients may report complete pain relief, this cannot be expected for all patients. In most patients, pain will be reduced to a more tolerable level. It may be considered therefore as an effective, minimally invasive treatment for these kind of conditions, offering the benefit of a fast procedure with long term pain relief and, typically, a very short post-operative recovery. Furthermore, we are the first to describe cryoanalgesia in total knee replacement pain.

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Corresponding author:

Martina Bellini, MD
Pain Management Unit San Carlo Clinic
Paderno Dugnano (MI), Italy
e-mail: Bellini_martina@libero.it

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