

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.

Method: We present here 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.

Results: We reviewed the records of 18 patients with articular lumbar facet pain, knee pain and sacroiliac pain. The Visual Analog Scale and Patient's Global Impression of Change scale show satisfaction at 1 month after cryoablation, with the best scores after three months. Only three patients showed a worse condition than the first month.

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

Key words: cryoanalgesia, pain, cryoneuroablation, cryoneurolysis

Anestezjologia Intensywna Terapia 2015, tom XLVII, nr 4, 346–348

Cryoanalgesia, that is the use of low temperatures to provide analgesia, is a pain management technique which can be applied to a variety of painful situations [1]. It is a method of relieving pain, when pain is caused by sensory nerves, by freezing the affected nerve branches, associated with the conduction of the painful impulses. The procedure is used for treatment of various intractable pain 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 causes the patients' pain.

However, even though the nerve conduction is interrupted by the freezing process, the nerve cell remains 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 ex-

tremity 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] or cervical facet syndromes [5], and coccygodynia, as well as to treat post-surgical pain [6]. The most common use for cryoanalgesia for lower back pain is the long term treatment of lumbar facet pathology [1]. Sacroiliac joint pain is treated frequently with these kinds of techniques, while knee pain is less common. The benefits of cryoanalgesia include long-term pain relief, reversible nerve block, a reduction in post-operative drug usage and the ability to repeat the procedure. The treatment is usually performed after a diagnostic procedure involving local anesthetic and a cortisone derivative and has shown at least temporary relief of symptoms. Currently, attention is focused on efficacy of cryoanalgesia in decreasing pain after thoracotomy surgery [7, 8].

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

Należy cytować wersję: *Bellini M, Barbieri M: Percutaneous cryoanalgesia in pain management: a case-series. Anaesthesiol Intensive Ther 2015; 47: 333–335. 10.5603/AIT.2015.0045.*

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

	Basal condition	1 month	2 months	3 months	4 months
Facet	8 \pm 1	5 \pm 1	4 \pm 1	2 \pm 1	4 \pm 1
Knee	8 \pm 1	5 \pm 1	4 \pm 2	2 \pm 2	4 \pm 2
Sacroiliac	8 \pm 2	5 \pm 0	4 \pm 1	2 \pm 0	4 \pm 0
Total	8 \pm 1	5 \pm 1	4 \pm 1	2 \pm 1	4 \pm 1
<i>P</i> -value	<i>P</i> < 0.0001				

METHODS

Our cohort consists of 18 patients who received cryoanalgesia at the San Carlo Clinic of Paderno Dugnano (Milan, Italy). The most common cause of pain was articular lumbar facet (12/18), followed by knee pain, having undergone knee arthroplasty (4/18), and sacroiliac pain (2/18). The patients were over 18 years old, and had, for more than 3 months, presented pain which was unrelieved by analgesics and physical therapy. Moreover, their pain had to be graded higher than 3 on a 10 point Visual Analog Scale (VAS) while the patients had failed the traditional radiofrequency techniques. Criteria of exclusion are pain only on some occasions, previous cryotherapy, pregnancy, psychiatric disease that interfere with a patient's adequate response to the result of the procedure, as well as a history of adverse reaction to lidocaine or bupivacaine.

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

Regarding facet joint pain, this is often considered a biomechanical pain, typically made worse on movement, particularly with hyperextension. These patients often fail a physical therapy program as the treatment aggravates the pain. We froze only the most symptomatic level (10/12 median branch, 2/12 median dorsal rami). Regarding sacroiliac pain, patients claimed to suffer 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 patient 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 was performed by means of a cryogenic probe and direct fluoroscopy guidance [1]. A local anesthetic 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

Table 2. Patients' Global Impression of Change scale (means \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

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 the visual analog scale VAS [9] evaluation and the Patients' Global Impression of Change (PGIC) scale [10]. The patients underwent a 4-month follow-up.

RESULTS

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. Moreover, 83.3% of the patients (15/18) 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 patient, treated for knee pain, showed a worse condition than the first month ("almost the same", 2 PGIC point) and did not change their score. The best scores were reached in the third month namely: a great deal better, and a considerable improvement that has made all the difference. At 4 months, we observed a decrease in the score from 7 to 6, which means "better", a definite improvement that has 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 popular than newer techniques such as pulsed radiofrequency ablation [11].

Brechner *et al.* [12] studied the effects of percutaneous cryoneuroablation of the lumbar facet in patients with neck and lower back pain, finding that there was 70% pain relief after 1 hour, a relief which lasted 1 week and which by 3 months had returned to the baseline.

Lloyd *et al.* [13] and Evans *et al.* [14] used cryoanalgesia to treat the sacral nerve roots in patients with intractable sciatica and perineal pain.

Ross *et al.* described 23 patients with complete, but only short term relief from lumbar facet blocks: While 21 had complete relief for a follow up of 6 months to two years, two patients had a return of pain six to eight months later.

Schuster *et al.* [15] studied 52 patients followed-up for a 13-month period, 47 of whom had significant relief of lower back pain after cryoneuroablation, and only one needing a repeat cryoanalgesia when the pain recurred after a 9-month pain free period. Regarding knee pain, there are no references concerning cryoanalgesia for the management of this pain, even if it is possible to find references about cold therapy [16].

Trescot [1] stated 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 in score from 5 to 7, and a 2-point change is significant from their last reported score. The best outcome was shown in the third month, with a 2-point change compared with the 1 month's score.

Our research has the limit of the small number of patients and of a limited follow-up period.

Patients reported pain relief for several months following this procedure. While some patients can report complete pain relief, this cannot be expected for all patients. In most patients, pain will be reduced to a more tolerable level. It can be considered as an effective, minimally invasive treatment for these kinds of conditions, and offers the benefit of being a fast procedure with long-term pain relief and, typically, a very short post-operative recovery period. Furthermore, we are the first to describe cryoanalgesia in total knee replacement pain.

ACKNOWLEDGEMENTS

1. Source of funding: San Carlo Clinic, Paderno Dugnano.
2. The authors declare no conflict of interest.

References:

1. Trescot AM: Cryoanalgesia in interventional pain management. *Pain Physician* 2003; 6: 345–360.
2. Kim PS, Ferrante FM: Cryoanalgesia: a novel treatment for hip adductor spasticity and obturator neuralgia. *Anesthesiology* 1998; 89: 534–536.
3. Calandria L: Cryoanalgesia for post herpetic neuralgia: a new treatment. *Int J Dermatol* 2011; 50: 746–50. doi: 10.1111/j.1365-4632.2010.04792.x.
4. Trescot AM, Noback CR: Cryoanalgesia in low back pain. In: Manchikanti L, Slipman C, Fellows B (eds). *Low Back Pain, Diagnosis and Treatment*. Paducah, KKY, 2002: 473–482.
5. Schuster GD: The use of cryoanalgesia in the painful facet syndrome. *J Neuro Orthopaed Surg* 1982; 4: 271–274.
6. Humble SR, Dalton AJ, Li L: A systematic review of therapeutic interventions to reduce acute and chronic post-surgical pain after amputation, thoracotomy or mastectomy. *Eur J Pain* 2015; 19: 451–465. doi: 10.1002/ejp.567.
7. Khanbhai M, Yap KH, Mohamed S, Dunning J: Is cryoanalgesia effective for post-thoracotomy pain? *Interact Cardiovasc Thorac Surg* 2014; 18: 202–209. doi: 10.1093/icvts/ivt468.
8. Sepsas E, Misthos P, Anagnostopulu M, Toparlaki O, Voyagis G, Kakris S: The role of intercostal cryoanalgesia in post-thoracotomy analgesia. *Interact Cardiovasc Thorac Surg* 2013; 16: 814–818. doi: 10.1093/icvts/ivs516.
9. Bihur PE, Silver W, Gallagher EJ: Reliability of the visual analog scale for measurement of acute pain. *Acad Emerg Med* 2001; 8: 1153–1157.
10. Hurst H, Bolton J: Assessing the clinical significance of change scores recorded on subjective outcome measures. *J Manipulative Physiol Ther* 2004; 27: 26–35.
11. Bellini M, Barbieri M: Cooled radiofrequency system relieves chronic knee osteoarthritis pain: the first case series. *Anaesthesiol Intensive Ther* 2015; 47: 30–33. doi: 10.5603/AIT.2015.0003.
12. Brechner T: percutaneous cryogenic neurolysis of the articular nerve of Luschka. *Regional Anesth* 1981; 4: 271–274.
13. Lloyd JW, Barnard JDW, Glynn CJ: Cryoanalgesia, a new approach to pain relief. *Lancet* 1976; 2: 932–934.
14. Evans PJ, Lloyd JW, Green CJ: Cryoanalgesia: the response to alternations in freeze cycle and temperature. *Br J Anaesth* 1981; 53: 1121–1126.
15. Schuster GD: The use of cryoanalgesia in the painful facet syndrome. *J Neural Orthopaed Surg* 1982; 4: 271–274.
16. Leutz DW, Harris H: Continuous cold therapy in total knee arthroplasty. *Am J Knee Surg* 1995; 8: 121–123.

Corresponding author:

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

Received: 4.11.2014

Accepted: 10.12.2014