



SCIENTIFIC DATA
SUMMARY of Published Studies and Clinical
Observation
NEUROCRYOSTIMULATION



SUMMARY OF PUBLISHED ARTICLES

SPORT MED * September 1996 * 'SPORTS AND MEDECINE' /

Dr H. Chick, Dr A.-L. Carayon, Dr J.-C. Rognon, Dr A. Cohpan (sports doctors).

Gaseous cryotherapy in the treatment of injuries to top athletes.

This study revealed the beneficial nature of gaseous hyperbaric cryotherapy, which enabled the rapid resumption of activity, thus avoiding the loss of cardio-respiratory capacity commonly associated with the post-injury period in top athletes.

Study conducted on 17 patients

Translation enclosed

KINESITHERAPIE SCIENTIFIQUE * 1998 * 'THE SCIENCE OF PHYSIOTHERAPY'

University hospitals of Strasbourg.

Professor Astrid Wilk, head of maxillo-facial surgery unit.

- *Study of the use of gaseous cryotherapy in maxillo-facial surgery for oedemata.*

The subject of this study is the impact of gaseous cryotherapy on patients with a zygomatic bone fracture combined with an orbital floor fracture. Such injuries usually provoke a major post-operative oedema. In all cases the post-operative oedema receded without adjuvants and the patient's condition was relieved.

Study conducted on 36 patients.

Translation enclosed

Journal Européen des Urgences* 2001 * 'European Journal of Emergency Treatment'

CHU* de la Cavale Blanche, Brest* research hospital

Doctor E.L'Her, intensive care unit and emergency department.

- *Initial study of cryotherapy-induced analgesia during an arterial puncture*

An arterial puncture to analyse blood gases is a frequent operation that, despite being painful, is more often than not carried out without prior pain relief. This preliminary study assessed the feasibility of emergency ward treatment, the tolerance and effectiveness of analgesia by gaseous cryotherapy, and the speed and ease of use in a hospital reception and emergency in-patient unit.

Study conducted on 40 patients.

Translation not available

SPORT MED * December 2001 * 'SPORTS AND MEDECINE'

Edouard Herriot research hospital, Lyon.

Dr E. Brunet-Guedj, Dr B. Brunet, Dr J. Girardier, Dr E. Renauld, Dr M. Daubard, Dr R. Manigand,
Sports Medicine Unit.

- *The impact of gaseous cryotherapy in the treatment of tendinopathies.*

The use of gaseous cryotherapy for the treatment of acute tendinopathies yields more rapid and satisfactory results than traditional treatment methods and has no observable side effects. It has a rapid impact on pain, and in over 60% of cases patients are able to take up sport again immediately after the treatment without recurrence of the condition.

Study conducted on 21 patients.

Translation enclosed

KINESITHERAPIE Les Annales* January 2002 * 'Physiotherapy Annals'

Christian Cluzeau.

Physiotherapist and inventor of gaseous cryotherapy.

- *Practices in physiotherapy: aches and pains and hyperbaric cryotherapy.*

Cryonic's cryotherapy is based on the sublimation of carbon gas at -78°C. When applied in a high pressure jet it induces a thermal shock with an immediate pain-killing effect for the patient through its inhibition of nociceptive nerve fibre activity and a biochemical effect on enzymatic production in the inflammation. Gaseous hyperbaric cryotherapy offers immediate and in some cases permanent pain relief.

Translation not available

SMS Le Spécialiste de la Médecine du Sport* October/November/December 2002 * 'The Sports Medicine Specialist'

D. Mathelin

General practitioner, St Raphaël

- *Cryotherapy and sports medicine: 'Gaseous hyperbaric cryotherapy'*

Whether measured against Hippocratic practices or the latest technology, cryotherapy stands out as an extremely useful method for sports doctors. The positive effects of cold can now be felt by doctor and patient alike through the regular use of gaseous hyperbaric cryotherapy, which produces satisfying results and makes it possible to cut down on the prescription of drugs and their undesirable side effects.

Translation not available

KINESITHERAPIE SCIENTIFIQUE * December 2004 * 'THE SCIENCE OF PHYSIOTHERAPY'**University of Brussels****Doctor Romain Meeusen and Doctor Franck Handelberg**

- *The influence of cryotherapy (Cryotron®) on pain and inflammation following a shoulder arthroscopy.*

This study measures the impact of post-operative cryotherapy on skin temperature, subacromial temperature and shoulder pain and inflammation.

Cryotherapy led to a marked reduction in post-operative pain. Furthermore, the impact of the Cryotron® method on the acute inflammatory reaction was extremely positive. Finally, it was observed that the increase in the level of CRP owing to inflammation was blocked by the Cryotron® treatment in patients with an acute inflammatory response.

Study conducted on 20 patients.

Translation enclosed

Official Journal Apodologie* December 2004 * 'Official Podiatry Review'**Christian Cluzeau.****Physiotherapist and inventor of gaseous cryotherapy.**

- *Neurocryostimulation in podiatry.*

The growing interest in this method among members of the healthcare profession shows that it is perceived as an up and coming treatment technique. It consists of applying a cold, high pressure jet to the affected area, is rapid, efficient and painless for the patient and can potentially be used to treat of a number of everyday conditions encountered at surgery level.

Translation not available

Archive of Physical Medicine and rehabilitation October 2007**Laurent MOUROT (Ph.D), Christian CLUZEAU, Jacques REGNARD (MD, Ph.D)**

From the department of Physiology (EA 3920 and IFR133), Franche Comté University, Besançon (Mourot, Cluzeau, Regnard) and Functional Explorations department, University Hospital, Besançon (Regnard), France.

- *Hyperbaric gaseous cryotherapy: effects on skin temperature and systemic vasoconstriction.*

Objective. To compare skin surface cooling caused by application of an ice bag (15 min) and by projection of CO₂ microcrystal (2 min) under high pressure (75 bar) and low temperature (-78°C), a modality called hyperbaric gaseous Cryotherapy (HGC).

Design. Randomized controlled trial with repeated measure.

Setting. Laboratory experiment.

Participants. 12 healthy male subjects (mean ± SD: 22.9 ± 1.8 years)

Interventions. Ice bag and hyperbaric gaseous Cryotherapy were randomly applied on the skin of the non-dominant hand.

Main Outcome Measure. Skin temperature of the cooled (dorsal and palmar sides) and contra-lateral (dorsal side) hands were continuously measured with thermistor surface contact probes before, during and after (30 min) cooling.

Results. HGC projection induced a large decrease ($P<.05$) of the dorsal skin temperature of the cooled hand (from $32.5 \pm 0.5^\circ\text{C}$ to $7.3 \pm 0.8^\circ\text{C}$), and a significant decrease of the skin temperature of the palmar side and of the contra-lateral hand. The skin temperature of the dorsal side of the cooled hand was decreased with an ice bag (from $32.5 \pm 0.6^\circ\text{C}$ to $13.9 \pm 0.7^\circ\text{C}$; $P<.05$). However, the lowest temperature was significantly higher than during HGC, and no significant changes in the other skin temperatures were observed. Rewarming was equal after the two modalities, highlighting a more rapid increase of the skin temperature after HGC.

Conclusion. HGC projection decreased skin temperature of the cooled and contra-lateral hand suggesting a systemic skin vasoconstriction response. On the other hand the vascular responses triggered by ice pack cooling appeared limited and localized to the cooled area.

JOINT BONE SPINE 74 (2007) 617-621

Dr Guy Chatap, Annabelle De Sousa, Karine Giraud, Jean-Pierre Vincent.
Service de G erontologie 4, H pital  mile Roux, Assistance publique-H pitaux de Paris, Universit  Paris XII,
Cr teil, France.

“Pain in the older people. A prospective evaluation of treatment by hyperbaric gaseous Cryotherapy (NeuroCryoStimulation)”

OBJECTIVE. To evaluate the effect of hyperbaric gaseous cryotherapy by carbon dioxide on severity of elderly people’s pain.

METHODS. An open prospective study was conducted in patients admitted in a geriatric centre, with several types of pain. At entry, the patients recorded a pain score, marked on a 100 mm visual analogical scale. This measure was repeated for comparison at the end of the treatment session.

RESULTS. Between May and June 2005, Fifty-five patients were enrolled. Mean age was 82 years. 41 patients (74,5%) had a rheumatic or orthopaedic pain, and ten patients (18,1%) presented neurological pain. Four subjects were enrolled for swelling or cutaneous haematoma. After a mean of four sessions of hyperbaric gaseous cryotherapy, pain scores decreased from 47 to 13 mm ($p < 0,001$) for the rheumatic or orthopaedic pains, and from 51 to 12 mm for the neurological pains.

CONCLUSION. Hyperbaric gaseous cryotherapy by carbon dioxide is a modern nonpharmacological technic to treat pain in elderly people.

Ann. Fr Med. Urgence (2014) 4 :89-95

M Morelle-F. Cardon. Jb Beuscart. JB Campagne . E Wel . E Boulanger . N Assez
Universitary Hospital of Lille France

“Place of NeuroCryoStimulation in the treatment of post traumatic pain in Emergency Department)”

OBJECTIVE. This work was designed to assess the antalgic effect of neurocryostimulation on traumatic pain in the emergency room.

METHODS. This prospective cohort study was conducted in an emergency room during 12 days. Patients who were more than 12-years old and admitted to the emergency room for up to 24h for trauma pain were included. After pain assessment by a pain intensity numeric rating scale (PRS; score 0 to 100) during the first medical contact (t0), the patients received a single neurocryostimulation session. Pain intensity was re-evaluated just after the cryotherapy session (t1), and when the patients went out of the emergency room (t2).

RESULTS. Forty-nine patients were included in this study. During the first medical contact (t0), the average pain intensity was about 63 ± 16 . The pain score rapidly decreased to 46 ± 23 (27% of reduction, $P < 0.05$) after the neurocryostimulation session (t1). Pain decrease was constant: the value of pain intensity at the release of patients from the emergency room was 34 ± 20 (26% of reduction $P < 0.05$). The decrease of pain intensity tend to be more important for patients with a PRS > 70 (49% of reduction, $P < 0.05$).

CONCLUSION. NeuroCryoStimulation is an effective antalgic technique for emergency trauma for mild and major pains, as a supplement to usual antalgic treatments.

Translation not available

Current study (2013) :

1- Doctor GUILLOT – Rheumatology department
CHRU de Besançon
2, place Saint-Jacques
25030 Besançon cedex -France

«Local Cryotherapy and hypervascular Doppler in the Inflammatory Rheumatism” (40 patients)
Publication: April 2015
(Translation of synopsis not available)

2- Health Central Authority of the French Army
Dr Denis Lagache, M Nicolas Vertu - Randomized Study (6 military hospitals for investigation)

“The Using of NeuroCryoStimulation in Military Ankle Sprains (TUNEMAS)” (in comparison with usual treatment)

- Primary Outcome Measures: Evolution of pain assessed by Visual analogic scale of pain
- Secondary Outcome Measures: Daily consumption of paracetamol
- Other Outcome Measures: number of days of temporary incapacity of work and number of days of work exemption

See description page 84 – End of the study: July 20142

3- Hospital Center of Verdun – CANADA – CSSS South West Verdun
Mr David Moreau

« Place of NeuroCryoStimulation for patients with a Total Replacement of the Knee Prosthesis: Evaluation of a new technology »

Study done on 64 patients divided in 2 groups: Experimental group and control group with ice packs)

To be published soon (2015). The study seems to prove that NCS would help to recover the active articular moves and reduce the time of hospitalization.

Clinical OBSERVATIONS

Doctor; where study conducted	Title and subject of document	Observations and conclusions
<p>Medical Rehabilitation Centre</p> <p>Michel Gedda Salins les Bains</p>	<p>6 MONTH CRYOTRON TEST (1995)</p>	<p>General observations on use of the Cryotron system</p> <p>Definition of protocols for:</p> <ul style="list-style-type: none"> -Muscle contracture -Ankle sprain -Haematoma in paraplegic patients -Meniscoid pain -Tendinitis of Achilles' tendon -Knee inflammation -RSD of the lower limb -Post-operative oedemata -Tendinitis of the knee, shoulder or patellar tendon -Post-operative treatments: complete knee replacement <p><u>Conclusion:</u> The Cryotron low temperature method provides physiotherapists with an effective and long lasting treatment solution. The system is easy to use, takes very little time and produces immediate results.</p>
<p>Atlantic Reflexotherapy Research Centre</p> <p>Mr Alain Comic Fontenay-le-Comte</p>	<p>GASEOUS CRYOTHERAPY AND RHEUMATOLOGY IN GENERAL PRACTICES</p>	<p>Definition of treatment protocols for chronic pathologies. (e.g. gonalgia, persistent aches and pains)</p> <p><u>Conclusion:</u> The extremely encouraging results obtained by use of the Cryotron system in rheumatology indicate that this treatment method offers potential in other branches of medicine.</p>
<p>Dr A Menjuc Rheumatologist</p> <p>CANNES</p>	<p>STUDY ON THE EFFECT OF NEUROCRYSTIMULATION ON MUSCLE CONTRACTURE</p>	<p>Observation of muscle relaxant effects in 10 patients</p> <ul style="list-style-type: none"> - Reduction of pain and contracture - Improved joint mobility <p><u>Conclusion:</u> Gaseous cryotherapy improves muscle contracture both in terms of pain and articular mobility, for whichever muscle is being treated; this is probably accountable to the thermal shock generated by the system's combination of a powerful jet with extreme cold. Further double-blind, randomised studies need to be conducted to establish how this method of cryotherapy works and its potential uses in tendino-muscular pathology.</p>
<p>Toulon Hand Centre Mr Alain Berthe Dr Fritch et al</p>	<p>BENEFITS OF GASEOUS CRYOTHERAPY IN IMMEDIATE POST-OPERATIVE HAND TREATMENT</p>	<p>Clinical Observation of 30 hand operation patients</p> <ul style="list-style-type: none"> - Reduction in pain - Immediate impact on oedema - Improvement in joint mobility and enhanced rehabilitation. <p><u>Conclusion:</u> Beyond the confines of this particular study <u>post-operative cryotherapy</u> has now become vital in all cases not involving specific circulatory complications.</p> <p>NB The cryotherapy treatment should be ended rapidly once factors inhibiting articular recovery have disappeared.</p>

Doctor; where study conducted	Title and subject of document	Observations and conclusions
<p>Geneviève Noret Brigitte Haiblet Corinne Ferrari Podiatrists</p> <p>NICE</p>	<p>BENEFITS OF GASEOUS CRYOTHERAPY IN PODIATRY</p>	<p>Observation Ingrown nails, hallux valgus and soft corns in 60 patients</p> <ul style="list-style-type: none"> - Painkilling effect - Reduction of the growth and faster healing - Impact on inflammation <p>Conclusion: The use of gaseous cryotherapy enables podiatrists to offer immediate relief and tangible results to patients. Extreme care should be taken to observe the treatment time to avoid an acute skin reaction; it is also important to remain sensitive to the patient's tolerance level, as people react in different ways to cold treatments. Cryotherapy can often be used to treat other pathologies such as heel spurs, fasciitis, metatarsalgia and sesamoiditis (thus reducing the need for plantar orthoses) as well as non foot-related disorders, such as dorsal and periungual corns, making this system indispensable in the modern podiatry practice.</p>
<p>Edouard Herriot Hospital Regional Centre for the Treatment of Haemophilia</p> <p>Lyon, France Dr Anne Lienhart Nadine Alliaume</p>	<p>EFFECTIVENESS OF TREATMENT BY GASEOUS CRYOTHERAPY IN HAEMORRHAGIC HAEMOPHILIC PATHOLOGY</p>	<p>Observation: six haemophilia patients received treatment over a 3 week period</p> <ul style="list-style-type: none"> - Tolerance and effectiveness of cryotherapy in haemophilia patients - Accidents involving acute haemorrhaging haematomas and/or acute hyperalgetic haemarthrosis - Accidents involving chronic haemorrhaging : chronic articular fluid build-up, inflammatory pathology <p>Conclusion: reabsorption of haematomas and immediate pain relief in the case of acute haemarthrosis. We also observed its effectiveness in the treatment of inflammation and chronic articular fluid build-ups. In all cases movement was regained rapidly, allowing for effective rehabilitation and a swift return to normal activity. This method therefore offers a marked improvement in the patient's quality of life</p>
<p>French Downhill Skiing Federation Stéphane Azzolin</p> <p>VAL D'ISERE (ALPS)</p>	<p>REPORT ON THE USE OF THE CRYOTRON SYSTEM A WEEK IN VAL D'ISERE</p>	<p>Treatment during competition: back, knee, hand, hip, wrist</p> <ul style="list-style-type: none"> - Pain-killing effect - Impact on muscle contracture and mobility - Swifter return to competition
<p>P.U.C. Rugby Department Mr Osmont</p> <p>Tests carried out at matches in various locations</p>	<p>RESULTS OF CRYOTRON TRIAL</p>	<p>Observation: traumatic and chronic pathologies Chronic pathologies prior to and following training Acute pathologies occurring immediately after injury</p> <p>Conclusion: Cryotherapy treatment enabled players to finish matches and reduce injury periods by 25 to 35%. The players requested that the Cryotron system be adopted as a result of the test.</p>
<p>NOT AVAILABLE IN ENGLISH</p>		

Doctor; where study conducted	Title and subject of document	Observations and conclusions
<p>François Buffaud</p> <p>Physiotherapist CSP LIMOGES Basketball</p>	<p>BENEFITS OF GASEOUS CRYOTHERAPY FOR TOP ATHLETES</p> <p>PUBLISHED IN SPORT MED 1998</p>	<p>Observations: daily use</p> <ul style="list-style-type: none"> - Post-training - Before the match (preventively) - During the match - Post-match <p><u>Conclusion:</u> The Cryotron is simple and quick to use, effective and well appreciated by the players; it has served us extremely well in a number of different areas. Indeed, both the players and the medical staff are taken with this method. Just imagine the effect, for example, of a player with a sub-calcanean haematoma that the MRI showed to be 3cm thick being able to resume a place in the team within three days, with the condition completely healed. I hope that this fantastic technique will soon become available to everyone in the profession. It will equip them better for what is a tough business and the time gains it offers will help them achieve the results required of them.</p>
<p>Alain Berthe Physiotherapist NICE</p>	<p>BENEFITS OF GASEOUS CRYOTHERAPY IN RSD</p> <p>PUBLISHED IN KINE SCIENTIFIQUE N° 405 NOV 2000</p>	<p>Discussion of the benefits of the treatment of RSD by cryotherapy:</p> <p>During the hot phase: the symptoms of RSD are a hot oedema, pains and skin dysesthesia, leading to complete immobility. During the cold phase: it is no longer the capillaries that pose the problem but rather a circulatory dysfunction in the main arteries, leading to coldness in the hand and the well-documented associated trophic disorders.</p> <p><u>Conclusion:</u> cryotherapy is a new technique that deserves our full attention on account of its use of very low temperatures and high pressure to induce a reaction known as a 'thermal shock', a method unheard of until now in traditional cryotherapy. Initial results show that the reactions achieved are faster and more effective than any we have encountered before now. This technique is therefore a significant reflex stimulation method that should be used to treat acute and chronic cases of RSD. The misuse or inappropriate use of ice packs as a cold treatment (cf. Collins et al.) can have an adverse effect on axonal transmission, which is not the case with gaseous cryotherapy, because of its rapid treatment time. Gaseous cryotherapy has become an indispensable technique in post-operative hand care.</p>
<p>Jan de Laere</p> <p>Lecturer at the Feusi School of Physiotherapy, Berne (Switzerland)</p>	<p>MYOFASCIAL TRIGGER POINTS- TREATMENT BY GASEOUS CRYOTHERAPY</p>	<p>Definition: a Myofascial Trigger Point (MTP) is an extremely sensitive, in some cases painful area, a few millimetres in width, located in a striated muscle or on its fascia. The patient experiences localised pain, sometimes accompanied by restricted movement and a weakening of the affected muscle structure.</p> <p>Observation: mechanical reflex actions influencing the nociceptive system, thermoalgaesic dissociation and the vasomotor system.</p> <p><u>Conclusion:</u> the treatment of Myofascial Trigger Points by gaseous</p>

Doctor; where study conducted	Title and subject of document	Observations and conclusions
		<p>cryotherapy is an innovative new technique that offers benefits to our patients. To become proficient in the technique requires special training by an experienced user.</p>
<p>Dr Marc Rozenblat Sports Doctor Paris</p>	<p>SIMULTANEOUS USE OF RADIAL SHOCK WAVES AND GASEOUS HYPERBARIC CRYOTHERAPY IN A SPORTS INJURY CLINIC</p>	<p>Observation on results: Simultaneous treatment by radial shock waves and gaseous hyperbaric cryotherapy of locomotor system pathologies in 333 patients over 15 months.</p> <p>Conclusion: Sports professionals are demanding and lack patience. They require treatment methods that are fast and effective. The simultaneous use of radial shock waves and gaseous hyperbaric cryotherapy fits these criteria and is a useful alternative to other, more conventional treatment techniques. The combination of these two methods yields a treatment relatively free of side effects, highly efficient and with indisputably rapid results (between 15 days and 3 weeks) that in almost 70% of cases enable patients to resume their sporting career earlier than expected, in good condition and with the same level of performance as before. The results from these first 15 months have convinced us that this treatment combination should be pursued; to substantiate and reiterate these good results will need the publication of further studies in the future using more patients, undoubtedly from a number of different areas, and spread over a longer time period.</p>
<p>Dr Frechinós Angiology Clinic Brive</p>	<p>GASEOUS HYPERBARIC CRYOTHERAPY IN PROCTOLOGY</p>	<p>Observations on and treatment protocols for the following pathologies: -oedematous prolapse -haemorrhoidal thromboses -pruritus ani -anal fistula and fissures</p> <p>Conclusion: Gaseous hyperbaric cryotherapy by CO₂ is an extremely useful technique in proctology, acting with remarkable speed and efficiency on oedematous prolapses, offering significant potential for the treatment of haemorrhoidal sclerosis, and very effective for all the more minor, incapacitating conditions, such as thrombus, pruritus, fissures and fistula. Useful improvements are being made to the technology, with the appearance of a new pistol specially designed by Cryonic with a long nozzle and a cold indicator light enabling much better control and more effective treatment.</p>