

COMPREHENSIVE GUIDE TO CRYOTHERAPY

Abstract

This guide explores cryotherapy, a technique using low temperatures for medical therapy. Tracing its roots to ancient practices, cryotherapy has evolved into a safe and effective treatment, eliminating damaged tissues non-invasively. The review emphasizes its applications in neurologic and musculoskeletal diseases, offering benefits like pain relief and reduced haemorrhage.

The principles of cryotherapy, physiological effects, and diverse benefits, including mood disorder treatment, are discussed. Indications cover various conditions, while contraindications address psychological and cardiac concerns. Pros highlight pain alleviation, while cons acknowledge limited empirical data.

Techniques range from commercial cold packs to cryosauna machines. The conclusion underscores cryotherapy's current applications, promising future prospects, and ongoing research into its immunological effects, showcasing its potential in advancing medical practices.

Keywords: Cryosurgery, Dermatosurgery, Pain Relief.

Authors

Patricia Reddy

Assistant Professor
MKSSS, Sitabai Nargundkar College of Nursing
Hingna , Nagpur.

Rama Danapure

Associate Professor
MKSSS, Sitabai Nargundkar College of Nursing
Hingna , Nagpur.

Priyanka Gujar

Nursing Tutor
MKSSS, Sitabai Nargundkar College of Nursing
Hingna , Nagpur.

Deepali Tayde

Nursing Tutor
MKSSS, Sitabai Nargundkar College of Nursing
Hingna , Nagpur.

I. INTRODUCTION

Cryotherapy is the technique of using low temperatures for medical therapy; this includes both destructive and non-destructive procedures. Cryosurgery is a type of cryotherapy in which diseased or aberrant tissues are destroyed using low temperatures; this is a destructive operation.

Cold therapy (cryotherapy) has been used since the Ancient Greeks. Cold remedies for acute injuries are mentioned by Hippocrates, Aristotle, and Galen. Before the development of artificial ice in 1755, the initial types of cold therapy were cold drinks and baths, as well as natural ice and snow. Cold has been widely utilised for the treatment of acute and subacute injuries, as well as for rehabilitation, since the 1940s. Cryotherapy, an age-old practice predating modern medicine, involves the application of cold to injured body tissue.

It has evolved into a safe and effective treatment for various medical conditions, eliminating damaged or diseased tissue without resorting to open surgery. This non-invasive procedure facilitates rapid recovery with minimal discomfort for patients.

Cryotherapy is a safe treatment. This procedure removes damaged or diseased tissue caused by a range of medical issues. Cryotherapy is typically performed without the need for open surgery. Most people recover quickly and with little pain from the surgery.

The thorough review of the existing literature on the application of cryotherapy in the treatment of various neurologic and musculoskeletal diseases. Physiological evidence and clinical studies strongly suggest that cold therapy can offer several benefits, including:

- **Reduction of Hemorrhage and Edema:** Cryotherapy has shown efficacy in mitigating acute trauma complications, such as sprains, strains, contusions, and lacerations, by reducing the degree of hemorrhage and edema.
- **Pain Relief and Muscle Spasm Alleviation:** In the context of acute and, to a lesser extent, chronic musculoskeletal injuries, cryotherapy has demonstrated the ability to alleviate pain and muscle spasms effectively.
- **Alleviating Pain, Edema, and Inflammation in Rheumatoid Arthritis Joints:** Research has demonstrated the efficacy of cryotherapy in diminishing pain, edema, and inflammation commonly experienced in rheumatoid arthritis patients.
- **Neuromuscular Facilitation in Neurologic Diseases:** Cryotherapy has shown promise in aiding neuromuscular facilitation for muscle reduction in individuals with neurologic diseases like spinal cord injuries, hemiplegia, and multiple sclerosis.
- **Assisting Neuromuscular Facilitation in Muscle Reduction:** Additionally, cryotherapy has been found to assist in neuromuscular facilitation for muscle reduction in other relevant contexts.

This comprehensive review sheds light on the potential therapeutic applications of cryotherapy, offering valuable insights into its use as a non-invasive and potentially effective treatment approach for various neurologic and musculoskeletal conditions. Further research and clinical investigations are warranted to fully understand and optimize its benefits in clinical settings.

1. Indications: Cryotherapy can be used to supplement treatment for the following conditions:

- Acute soft tissue injuries (e.g., ankle sprain, muscular strain, ligament sprain)
- Myofascial trigger points
- Muscle spasm
- Muscle guarding
- Tendinitis
- Tenosynovitis
- Acute swelling
- Bursitis
- Post orthopaedic surgery (e.g., TKR, ACL reconstruction, arthroscopic shoulder surgery.) Reducing temperature.
- Reducing temperature
- Delayed onset muscle soreness

2. Principles

- When Ice is applied to the skin, heat is conducted from the skin to ice in order to melt it.
- Latent heat: A specific amount of energy is required to change the solid form of a particular substance into a liquid, or the liquid into a gas.
- By the use of cryotherapy heat from the tissues of the body is absorbed by the cooling agents.
- Heat loss from the tissues is more when ice is used in place of water.

3. Cooling: The magnitude of cooling depends upon:

- **The Area:** According to the size and conductivity of the tissue exposed.
- **The Temperature:** Difference between the temperature of the cooling agent and the tissue it's being applied to.
- **The Duration:** Time period of the cold application.

4. Physiological Effects

- Diminished local temperature
- Suppressed metabolic activity
- Initial constriction of arterioles and capillaries
- Initial reduction in blood flow
- Slower transmission speed of nerve impulses
- Reduced presence of leukocytes and phagocytes
- Hindered drainage of lymphatic and venous systems
- Lowered excitability of muscles
- Decreased depolarization of muscle spindles
- Limited development and buildup of edema
- Strong anesthetic impact

5. Benefits of Cryotherapy

- Alleviates migraine symptoms
- Numbs nerve irritation
- Assists in treating mood disorders
- Reduces arthritic pain
- May be beneficial in treating low-risk tumors
- May contribute to the prevention of dementia and Alzheimer's disease
- Effective in treating atopic dermatitis and other skin condition

6. Contraindications

- **Psychological Conditions:** Some patients may experience fear or discomfort with the application of ice, believing it worsens their condition. In such cases, if the therapist is unable to convince or demonstrate the benefits of ice, it is advisable not to use it.
- **Cardiac Conditions:** Patients recovering from a myocardial infarction should avoid ice treatment for six months. The initial shock of ice can cause a significant drop in blood pressure and an increase in heart rate. Application of ice on the left shoulder may stimulate excitatory impulses to the heart, making it unsuitable for patients with cardiac disorders.
- **Cryoglobulinemia:** This condition involves abnormal proteins in the blood that can precipitate at low temperatures, leading to blocked blood vessels and local ischemia.
- **Peripheral Nerve Injury:** Cooling an area supplied by a severed peripheral nerve with ice may disrupt the normal response of blood vessels to cooling. This could result in excessive coldness in the area and prolonged time to regain a normal temperature.
- **Cold Urticaria:** Cold exposure can trigger the release of histamine from mast cells, causing local redness (erythema) and, in some cases, symptoms like lowered blood pressure and elevated pulse rate.
- **Vasospastic Disease:** Vasospastic conditions like Raynaud's disease can worsen with the application of ice
- **Peripheral Vascular Disease:** Ice is avoided in cases of peripheral vascular disease as it may further reduce an already inadequate blood supply. However, it is uncertain whether cold treatment would lead to gangrene due to the lowered metabolic rate of the tissues.
- **Cold Sensitivity:** Despite precautions, a small number of patients may still react adversely to ice. They may develop a local histamine-like urticaria, resembling a nettle rash, which causes itching. Such patients are not suitable for ice treatment

7. Pros

- Achievement of Pain Alleviation
- Reduction in Swelling
- Decreased Skin Temperature
- Demonstrated Effectiveness for a Wide Array of Soft Tissue Injuries

8. Cons

- Limited empirical data available concerning the optimal treatment duration and frequency for achieving desired outcomes.
- Compression has displayed greater efficacy within postoperative scenarios.
- Occasional instances have reported bradycardia and symptoms reminiscent of frostbite.
- Some highly developed cryotherapy apparatuses may impede the range of motion post total knee replacement (TKR) due to joint immobilization.

9. Techniques of Cryotherapy

- The application of severe cold to aberrant tissue. Cells cannot resist the extreme cold and perish as a result of therapy.
- A variety of chemicals can be employed by your healthcare professional to produce the severe cold used in cryotherapy.
- Liquid nitrogen is one of these chemicals.
- Argon gas and liquid nitrous oxide.

10. Application Methods: Commercial Cold Packs

- Ice Packs
- Vapocoolant Spray
- Immersion
- Ice Massage
- Cryosauna Machine
- Ice Bath
- Liquid Nitrogen Vapour

II. CONCLUSION

Cryotherapy has emerged as a safe and effective treatment method, showcasing promising results in diverse areas of healthcare. By effectively reducing edema, ecchymosis, and pain, cryotherapy has proven its potential in managing various ailments. Notably, in the realm of cancer treatment, cryotherapy has shown promising outcomes, particularly in the treatment of tumours' and bleeding.

Beyond its role in cancer therapy, cryotherapy has also proven beneficial as a modern and healthy approach for fat reduction. The treatment involves subjecting the body to super-cooled temperatures in a freezing chamber for a brief period. This method has demonstrated its efficacy in reducing waistline measurements while simultaneously contributing to lower cholesterol and blood glucose levels.

Furthermore, cryotherapy's future prospects appear promising, with new studies focusing on its immunological effects through cryoablation. The ongoing research on immunological responses could unlock further potential in harnessing cryotherapy for various medical conditions.

In conclusion, cryotherapy presents a multi-faceted approach to healthcare, encompassing benefits in the realms of pain management, tumor treatment, fat reduction, and possibly more, thanks to the evolving knowledge about its immunological effects. Continued investigation and exploration of cryotherapy's capabilities hold immense promise for improving patient outcomes and advancing medical practices.

REFERENCES

- [1] Kwiecien SY, McHugh MP. The cold truth: the role of cryotherapy in the treatment of injury and recovery from exercise. *Eur J Appl Physiol*. 2021 Aug;121(8):2125-2142. doi: 10.1007/s00421-021-04683-8. Epub 2021 Apr 20. PMID: 33877402.
- [2] Jardak MN, Saad EA, Jalloul R, Emmanuel N, Nicolas G, Menendez JP. The efficacy of cryotherapy in reducing edema and ecchymosis in patients who underwent rhinoplasty: A narrative review. *J Plast Reconstr Aesthet Surg*. 2023 Apr 19;84:279-286. doi: 10.1016/j.bjps.2023.04.053. Epub ahead of print. PMID: 37356305.
- [3] Rabe E, Partsch H, Morrison N, Meissner MH, Mosti G, Lattimer CR, Carpentier PH, Gaillard S, Jünger M, Urbanek T, Hafner J, Patel M, Wu S, Caprini J, Lurie F, Hirsch T. Risks and contraindications of medical compression treatment - A critical reappraisal. An international consensus statement. *Phlebology*. 2020 Aug;35(7):447-460. doi: 10.1177/0268355520909066. Epub 2020 Mar 2. PMID: 32122269; PMCID: PMC7383414.
- [4] <https://my.clevelandclinic.org/health/treatments/21099-cryotherapy#:~:text=Cryotherapy%20is%20a%20minimally%20invasive,procedure%20and%20with%20little%20pain.>
- [5] <https://bodywrl.com.au/does-cryotherapy-work-for-fat-loss/#:~:text=Studies%20have%20shown%20that%20cryotherapy%20can%20help%20you%20lose%20weight,to%2Dheight%20ratio%20after%20cryotherapy.>
- [6] <https://www.physio-pedia.com/Cryotherapy>
- [7] Suarez-Roca H, Mamoun N, Sigurdson MI, Maixner W. Baroreceptor Modulation of the Cardiovascular System, Pain, Consciousness, and Cognition. *Compr Physiol*. 2021 Feb 12;11(2):1373-1423. doi: 10.1002/cphy.c190038. PMID: 33577130; PMCID: PMC8480547.
- [8] Ikäheimo TM. Cardiovascular diseases, cold exposure and exercise. *Temperature (Austin)*. 2018 Feb 1;5(2):123-146. doi: 10.1080/23328940.2017.1414014. PMID: 30377633; PMCID: PMC6204981.
- [9] <https://www.physio-pedia.com/Thermotherapy>
- [10] Hubbard TJ, Denegar CR. Does Cryotherapy Improve Outcomes With Soft Tissue Injury? *J Athl Train*. 2004 Sep; 39(3):278-279. PMID: 15496998; PMCID: PMC522152.
- [11] Cryoablation: Cryotherapy, Cryosurgery. (n.d.). Cleveland Clinic. <https://my.clevelandclinic.org/health/treatments/16903cryoablation#:~:text=Cryoablation%20is%20a%20procedure%20that>
- [12] Physiopedia. (n.d.). Cryotherapy. Physiopedia. <https://www.physio-pedia.com/Cryotherapy>
- [13] #stayfitwithanand. (2021, February 26). Cryotherapy- Cold therapy on an acute injury. #Stayfitwithanand. <https://medium.com/stayfitwithanand/cryotherapy-cold-therapy-on-an-acute-injury-dde58f2dd05e>
- [14] Block, J. E. (2010). Cold and compression in the management of musculoskeletal injuries and orthopedic operative procedures: a narrative review. *Open Access Journal of Sports Medicine*, 1, 105–113. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3781860/>