Cryotherapy - When and How to Use It

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A patient comes to you with a hurt back (ankle, knee, shoulder or elbow, etc.). You are wondering what to use - heat or cold (also know as Cryotherapy). This is the process you will go through.

Historical Perspective

Historically, the use of physiological therapeutics, like cold, to facilitate the body's healing has been recorded in early civilizations in both the Western and the Eastern cultures. In the Chinese Kong-Fou, written almost 4700 years ago, the use of massage is well documented. The Japanese also have well documented the use of physiotherapy as early as 600 B.C..

Stages of Healing

To determine which physiological therapies to use, one needs to understand the stages of healing. Musculoskeletal injuries, whether external frank trauma or internal microtrauma, have three stages of healing.

These include:

1. Acute Inflammatory Stage where the body is dissolving of blood elements and tissue debris characterized by swelling, heat, redness and local pain/tenderness;

2. Reparative Stage where the body is laying down fibrin and fibroblasts which begin the repairs characterized by local heat, redness, tenderness, decreased circulation and decreased flexibility;

3. Toughening/Remodeling or Rehabilitation Stage where the body has fibrous deposition (scar tissue) and chronic inflammatory reaction characterized by palpable thickening and induration of the area.

This course will concentrate on cold therapy in the form of ice and cold packs for the Acute Inflammatory Stage.

Hemorrhage and Edema in the Healing Process

In the initial trauma, there is some degree of hemorrhage and edema. The healing begins when the bleeding stops. Cryotherapy, known as cold therapy, assists in this healing process by stopping the bleeding and inflammation.

Cold therapy may be applied in many forms. These include ice, cold packs, vapocoolant sprays, clay compresses, cold therapy, cold immersions, cryokinetics and alternating heat and cold.

Physiological Effects of Cryotherapy

The primary effect of Cryotherapy is hypothermal or removing heat from the body. The secondary effects include decreased blood flow, decreased in metabolism, decreased inflammatory response and reduction of edema. Patients will also experience an analgesic effect.

Leaving cold therapy on a body area for too long may trigger

1. Local vasodilation and

2. Reflex internal vasodilation – opposite of the initial response.

The result is local body area swelling. The adage "A little is good a lot is much better" does not hold true in the case of cold/ice therapy.

The General Rules of the Application of Physiotherapy

1. In general, when applying physiotherapy, whether it be cold therapy or other therapies, it must be varied depending on the process at hand to assist the body in normalizing or adapting to the condition. The goal is to stop or reverse the abnormal reaction that is delaying the healing process. All inflammatory processes are continuous in its production of harmful effects on the patient until either the inflammatory process or the individual's defensive powers are defeated. Treatment frequency should be based on the condition and the major or dominate process at hand and the change in the dominate feature during therapy.

2. Be sure you are confident with the condition you are treating. This includes knowing the conditions symptoms, pathophysiology, etc.

3. The therapy used must be suited for the presenting complaint. In this case Cryotherapy.

4. Long periods of time between treatment, once per week or more, are of little or no value and will result in failure.

5. Avoid over treatment with certain physiotherapy modalities.

6. Communicate with the patient what to expect. This includes long-term results, temporary results, the anticipated number of treatments, etc.

Indications and Contraindications for Cold Therapy

Compared to other physiotherapeutic modalities, cold therapy has few contraindications or reasons not to use it. It is one of the safest modalities that can be used. A list of reasons to use and not use cold therapy are listed in Table 2: Indications and Contraindications of Cryotherapy

Application of Ice and Cold Packs

This initial acute inflammatory phase will last about 48 to 72 (or more) hours when ice therapy is immediately applied to reduce inflammation and allow healing to progress. For maximum benefit, ice needs to be applied at least five times over a 24-hour period, with at least one hour in between applications for circulation to return before starting the next ice treatment.

Note that no ill effects to the skin like freezer burns, do not occur until the normal skin is reduced below 50 degrees Fahrenheit. Depending on coldness of your ice pack, a paper towel between the skin and the ice pack, may be required. Evaluate your ice pack cooling unit to determine if a paper towel is needed to insulate the patient's skin from the ice pack or the cooling unit needs to have its temperature setting adjusted.

Note: If the skin temperature does go too low, a freezer burn can occur. The localized area has a red elevated appearance described as mottled. If this occurs, the condition will usually resolve itself in a few hours to a day or two. Application of moist warm, not hot, towels, will increase the blood flow and warm the skin.

The amount of time that ice is to be applied depends on the thickness or size of the body area. The amount of muscle and/or fat in the area will change the application time.

As a general guideline,

Small body areas like the hand, feet, elbow and neck requires 10 minute application.

Medium sized body areas like the midback, shoulder, knee requires 15 minutes of application.

Large areas like the low back and buttock, 20 minutes of application.

(Table 3: Application Time of Ice)

Staying within these general time lines is a safe bet. The old saying, "a little is good, therefore a lot is better" does not apply here, If ice is left on too long, it will produce

increased swelling and make the condition worse. After the acute phase has passed, the other phases of healing can proceed. Unfortunately, I have seen patients 12 months post-injury who still have swelling, heat and local muscle spasm because they forgot to apply ice and take the injury through the acute phase of care.

Sensations of Cold Therapy When Applied to the Body

The normal sequence of sensations with cold therapy is as follows: initially the ice/cold pack will feel cold, then it moves into a burning sensation (like the area is on fire and lasts for about 3 minutes), followed by aching (which lasts only about a minute) and finally numbness (almost analgesic).

The goal of cold therapy is to allow the area being treated to become cold enough to feel numb (almost analgesic).

Conclusion

Cold therapy is an important physiotherapy modality in the acute inflammatory phase of frank trauma or micro trauma. Cold therapy shuts down the associated edema, heat and hemorrhage associated with trauma so the healing process may continue through the Reparative and Toughening/Rehabilitation Stages.

The Acute Inflammatory Stage lasts for approximately 48 to 72 hours or more.

The application of the ice is dependent on the size of the body area involved and can range from 10 to 20 minutes. The ice needs to be done at least 5 times every 24 hours with at least one hour between applications.

The patient will go through four sensations when cold is applied. These include the initial cold, then burning, achy and finally numbness. Burning of the skin is to be avoided by adjusting the cooling unit and/or use of a paper towel between the ice pack and the skin.

When compared to other physiotherapeutic modalities, there are relatively fewer reasons not to use ice therapy, however the contraindications to use ice should be respected in the patients treatment plan.

The application of heat to an Acute Inflammatory Stage will make the condition worse, take longer to heal and may cause increased scar tissue with associated reduced flexibility and loss of muscle elasticity. Cold therapy must be used in the Acute Inflammatory Stage to reduce the treatment time, increase the healing process and minimize the residuals associated with trauma. After this is done, the other heating therapies may be introduced.

Table 1: Stages of Healing	
Stage	**Physiological Responses**
Acute Inflammatory Stage (Duration: 48 to 72 hours from beginning of treatment)	Body is dissolving of blood elements and tissue debris characterized by swelling, heat and local pain and tenderness
Reparative Stage (Duration: 48 hours to 6 weeks from beginning of treatment)	Body is laying down fibrin and fibroblasts which begin the repairs characterized by local heat, redness and tenderness
Toughening/Remodeling or Rehabilitation Stage (Duration: 3 weeks to 12 plus months from beginning of treatment)	Body is laying fibrous deposition (scar tissue) and chronic inflammatory reaction characterized by palpable thickening and induration of the area

Table 2: Indications and Contraindications of Cryotherapy	
Indications	**Contraindications**
Sprains/strains (acute)	Impaired circulation
Bursitis, Tendinitis	Peripheral vascular disease
Prestretching of Muscles	Loss of thermal sensitivity
Relaxation of muscle spasms in patients who have had a cerebrovascular accident	Psychological opposition to ice therapy
Traumatic injuries to the central nervous system, including the spinal cord	Raynaud's disease
Swelling, heat in the muscular system	Chilblain (pernio)
Inhibit bleeding after acute trauma	Coma
Relieve pain and reduce the associated muscle spasm	Rheumatoid or gouty arthritis
Decrease blood flow to an area of acute inflamation	Cryesthesia
Spasticity	Paroxysmal cold hemoglobinuria
Burns	
Closed pressure sores	
Reduce adverse tissue changes and relieve pain in the first aid treatment of insect and snake bites	
Angiomas	
Boils and carbuncles	
Febrile states	
Herpes blisters	
Varicose ulcers	
Warts	

Table 3: Application Time of Ice		
Size of Body Area	**Sample Area**	**Length of Ice Application in Minutes**
Small	Neck, Ankle, Shin, Hands, Feet, Elbow	10 Minutes
Medium	Mid Back, Shoulder, Knee	15 Minutes
Large	Low Back, Pelvis, Buttock, Thigh	20 Minutes

References and Recommended Reading:

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2. Jaskoviak, P, Schafer RC, Applied Physiotherapy, Associated Chiropractic Academic Press, Arlington, VA 1986.

3. Christensen, KD, Chiropractic Rehabilitation Volume 1: Protocols, Publication Division CRA, Ridgefield, WA, 1991.

4. Kisner C, Colby LA. Therapeutic Exercise: Foundations and Techniques, F.A. Davis, Philadelphia, PA, 1990.