



Chapter 4 – Physiological Therapeutics

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Cryotherapy



CRYOTHERAPY

PHYSIOLOGIC EFFECTS OF ICE APPLICATION

1. Decreased circulation
2. Local vasoconstriction
3. Decreased inflammatory effects
4. Decreased metabolism
5. Increased tissue stiffness
6. Decreased muscle spasm
7. Decreased pain
8. Decreased nerve conduction velocity

INDICATIONS FOR USE

Ice is the modality of choice in acute trauma and sub-acute injury because of its physiologic effects on injured tissue. Decreased circulation, decreased metabolism, and decreased inflammatory effects reduce the secondary trauma that can occur following injury. For example, secondary hypoxic injury (cell death due to poor oxygen supply) caused by disrupted circulation is minimized by decreasing cellular metabolism, thereby decreasing oxygen demands.

Inflammation is also reduced because of the effects on blood flow of ice, including vasoconstriction (slowing the hemorrhaging in the area) and decreased histamine release.

CONTRAINDICATIONS AND PRECAUTIONS

Ice application is absolutely contraindicated in patients allergic to cold (may produce hives and joint pain), Raynaud's phenomenon (causes arterial spasm leading to possible ischemic necrosis), impaired circulation, peripheral vascular disease, open wounds, and local infection.

Ice should be used with caution over some rheumatoid conditions (increases pain and joint stiffness), paroxysmal cold hemoglobinuria with renal dysfunction and secondary hypertension, very young/very old patients, history of frostbite in the area, and coma.

PREPARING THE MODALITY

General considerations

Treatment time- Ice applied in one area for extended periods of time (over half an hour for most patients, less in patients with poor circulation) can result in frostbite. Therefore, length of treatment time is the most important treatment parameter to consider (see Techniques of Application for suggested treatment times). In patients with acute conditions, ice is recommended several times a day during the first three to four days following injury. However, if the body is not given sufficient time to warm up between applications, each subsequent ice application will cool the tissue lower and lower, possibly causing tissue damage. To prevent



this, time between ice treatments should be at least one hour to allow the tissue to warm back up.

Modes of application- Ice therapy should provide deep penetration to be fully beneficial. Therefore, freezing sprays are not as effective as ice because they are very superficial. Ice packs, ice massage, ice water whirlpool, and iced wet towels are all more effective. Commercial ice packs are also effective, but the freezer in which they are stored must be at freezing temperature. Also, commercial packs warm up more rapidly during application, whereas ice remains at a cooler temperature throughout the treatment.

Table 1. Forms of cryotherapy and their effect on intramuscular temperature

	Temperature decrease in (°C)			
	15 min	30 min	45 min	60 min
Ice	3.4	6.9	9.2	11.3
Gel pack	1.8	4.4	6.5	8.4
Chemical	1.6	2.9	3.0	3.5

(McMasters, W.C. *Am J Sports Med* 5:124-126,1977)

PATIENT PREPARATION

It is essential to educate the patient regarding the sensations they will feel during the treatment. When patients are warned in advance what to expect, reported discomfort during ice application is considerably decreased, therefore, an understanding of the stages of cold is important in preparing the patient.

Four stages of cold

1. Cold; 1-3 minutes
2. Aching / stinging / discomfort
3. Pain / burning; 2-7 minutes
4. Numbness; 5-15 minutes

TECHNIQUES OF APPLICATION

Commercial cold pack/bag of ice

Either a commercial available gel pack kept in a freezer at 8°C can be used, or fill a plastic bag full of ice and a little water.

Treatment time: 15-20 minutes. Wait at least 60-minutes before reapplying.

Mode of heat transfer: Conduction

Penetration: 1/2 inch



Application Procedure:

- Step 1: Dampen a towel and wrap cold pack in it (1 layer, allows even and more efficient conduction of cold)
- Step 2: Place on treatment area
- Step 3: Cover with dry towel for insulation

Ice Massage

Treatment time: Until numbness (never more than 15 minutes; always stop when patients say they feel numbness in the area of treatment)

Mode of heat transfer: Conduction

Penetration: 1/2 inch

Application Procedure:

- Step 1: Test the patient for reaction to cold.
- Step 2: Put a towel around the area of treatment to absorb water (6" square is the maximum treatment area)
- Step 3: Tear away the upper part of the paper cup but leave the lower half of the paper on the cup to hold on to
- Step 4: Rub the ice directly on the treatment area, continuously moving the ice to prevent frostbite. Apply ice massage in a circular pattern, with each succeeding stroke covering half the previous stroke, or in a longitudinal motion, with each stroke overlapping the previous stroke.

Slush bucket

Fill a bucket with half water and half-crushed ice. If treating the foot, a cap to cover the toes makes the treatment considerably more bearable. This treatment is very intense; occasionally patients may feel nauseated or lightheaded during the treatment. Except in extreme cases, be sure the patient remains in the ice constantly throughout the treatment and is fairly still or they will never get numb. Patients will quickly build up tolerance to this treatment when done on a regular basis.

Treatment time: 15 minutes. Wait at least 60-minutes before reapplying.

Mode of heat transfer: Conduction

Penetration: 1/2 inch

Application Procedure:

- Step 1: Test the patient for reaction to cold
- Step 2: Place the injured area in the bucket of ice
- Step 3: Monitor patient throughout the treatment for lightheadedness and nausea



POST-TREATMENT PROCEDURES

Documentation following treatment should include how the patient's condition was immediately affected following application, the treatment protocols that were used, any changes that need to be made for the next treatment, frequency of application, and any home instructions that are given to the patient.

Reference Consulted

Prentice, William E., *Therapeutic Modalities for Allied Health Professionals*, McGraw-Hill, 1998.



COLD THERAPY – PATIENT HANDOUT

(Cryotherapy)

WHEN IS COLD THERAPY USED?

Health care practitioners frequently prescribe ice for a wide range of muscle and joint complaints. The use of cold in therapy, or cryotherapy, is often applied to a new injury or a recently reinjured old injury to decrease pain, muscle spasm, and swelling.

WHY IS COLD THERAPY USED?

Ice minimizes inflammation. Ice is the safest, simplest, and most effective way of treating sprains, strains, muscle spasm, and bruises.

WHAT WILL I FEEL?

When ice is properly applied, the following sensations will occur in the following order during a normal treatment:

1. cold
2. increasing discomfort or aching feeling
2. a painful or burning sensation
3. numbness or significant pain reduction

The first time you apply ice, it can be very uncomfortable, but each treatment will get easier and easier as you get used to the ice application.

HOW DO I APPLY COLD THERAPY?

The easiest, safest, and most effective way of applying ice at home is to use a plastic bag half filled with ice cubes and wrapped in a single layer of damp towel. The ice should be applied directly over the injury and left on for a period of fifteen to twenty minutes. It can be reapplied as necessary so long as there is a 60-minute wait between applications to allow the temperature of the injured tissue to return to normal. Generally, the application of ice to a new or recently aggravated injury is most effective in the first 24 to 72 hours.

Another method of ice application at home is ice massage, which can be done with an ice cube or a paper cup filled with water then frozen. Application of ice massage should last until the area is numb or no longer than 15 minutes and should be applied directly over the site of injury in a circular motion from the center of the injury out in an area no bigger than your hand. If you have problems with circulation or decreased sensation in the injured area, talk to your chiropractor before beginning treatment.