

A Review of the Biophysics and Clinical Application of Cold Infrared Therapy (Cryotherapy)

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Any object with a temperature exceeding 0 degrees Kelvin (-273 degrees C.) is radiating energy in infrared spectrum. Cryotherapy, or cold therapy, is therefore cold infrared therapy and may be administered in any of the three physical states of matter: gaseous (fluroethyl), liquid (ice water), and solid (ice packs).

Cryotherapy should be avoided with individuals who are uncommonly sensitive to cold applications. Reflex shock reactions may occur with these patients. Also, the elderly may be predisposed to cellular damage due to an inadequate response by the thermoregulatory system to the local reduction in tissue temperature. Development of cyanosis by the exposed tissues will serve as a warning of this.

Fluroethyl spray may be used to treat a small area of tissue in preparation for stretch procedures as advocated by Travell, or as a modality in the treatment of superficial warts. Ice water is appropriate cryotherapy when treating an acral appendage to avoid traumatic edema. Ice packs may be used to treat body regions not appropriate for immersion and may be substituted with silicone gel wrap very adequately. This author recommends the use of a moist wrap between the ice pack and the skin surface to enhance the effect of convection in the treatment process.

A common treatment time is 10 to 15 minutes and the tissue treatment at the treatment site should never be lower than 15 degrees C. Some degree of pallor present after a 10 to 15 minute treatment period should be anticipated; however, if cyanosis appears, severe vasoconstriction has occurred and treatment must be discontinued. Cooling of body tissues normally results in periodic bursts of vasodilatation due to response by the thermoregulatory system to cooling of the acral parts (the "hunting reflex" -- Sir Thomas Lewis). Failure of this mechanism usually results in local cellular injury due to cold temperature.

To achieve therapeutic results from cryotherapy which are consistent with the physiological responses of the body to cold infrared application, apply the cold agent to the body area being treated for 10 to 15 minutes, maximum, and then transfer the same treatment area to hot infrared (warm water) for 5 to 8 minutes. This contrast exposure sequence is consistent with the time/temperature response of the body physiologically when the hypothalamic control mechanism reacts by way of the thermoregulatory system. This reaction influences the peripheral vascular system, under vasomotor control, to respond with vasoconstriction, and then vasodilatation. Reflex vasodilatation provides for a local influx of warm arterial flow to avoid cell injury due to cold temperature.

Cryotherapy, or cold infrared, is used in acute orthopedic conditions with the intention of controlling traumatically-induced edema. If the cold-pack is withdrawn after the proper exposure time, then temperature change will usually be confined to the integument and immediate subcutaneous tissues, thereby avoiding penetration to deeper muscular tissues, in which case

nutritional supply to viable tissues could be diminished to the point of injury. Generally, a decrease in skin temperature of 5 degrees C. is sufficient to reduce motor nerve activity resulting in a reduction in muscle spasm.

Suggested treatment following 1) trauma to soft tissue, 2) initially in fracture, and 3) following reduction in dislocation is:

a) immediately apply cryotherapy to the traumatized area employing contrast exposure, or the method of your choice.

b) wrap the traumatized part in elastic bandage, or other suitable garment to reduced range of motion without abolishing it. This will enhance areolar tissue deposition, rather than collagen. Of course, if fracture is present, it must be treated appropriately.

c) if the non-fractured joint is orthopedically stable, encourage use of the joint within tolerance limits to enhance areolar repair.

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