



Chapter 4 – Physiological Therapeutics

2

Superficial Heat

Superficial Heat

PHYSIOLOGICAL EFFECTS OF HEAT APPLICATION

- | | |
|--|--|
| 1. Increases blood flow | 5. Promotes abnormal ossification |
| 2. Increases cellular metabolic rate | 6. Heat may prevent adhesion formation |
| 3. Increases inflammatory response and edema | 7. Promotes reabsorption of hematomas |
| 4. Increases possibility of hematoma becoming infected | 8. Analgesia |

Superficial heat such as paraffin bath or hydrocollator packs directly heat the skin and indirectly increase temperature in deeper tissues up to one hour following an application. However, deeper tissues do not benefit as much from treatments because very little effective heating occurs.

GENERAL COMMENTS

Superficial heat is most effective as a relaxing and palliative modality for patients experiencing tension or hypermyotonicity. Heat tends to be overused by patients for conditions where it is not appropriate, such as low back pain or muscle soreness following exercise. Because the detrimental effects are not felt until later in the day, the connection may not be traced back to the heat therapy. Patient education is therefore very important, because superficial heat (such as electrical heating pads and microwave hot packs) is the most common modality purchased by patients for home use.

Following an acute injury, people often ask if they should apply heat or cold. The table below shows the healing rate of acute grade 2 and 3 ankle sprains following cryotherapy and heat therapy. Application of heat to these acute injuries noticeably delays healing.

	Cryotherapy		Heat
	<24 hours	>48 hours	
Grade 2 – 3	6 days	11 days	15 days
Grade 3	13 days	30 days	33 days

(Hocutt, Jaffe, Rylander, Beebe, Am J Sports Med 10:316-319, 1982)



INDICATIONS FOR USE

Heat is most commonly used for its immediate soothing and palliative effects. However, other benefits can include increased extensibility of collagen, decreased joint stiffness, relief of muscle spasm, reduced inflammation, edema, exudates and increased blood flow.

Heating modalities are particularly useful when applied prior to other procedures, such as massage, stretching, exercise, and adjusting/manipulating. By stretching the tissue during or immediately after heat treatment, the muscle fibrosis, contracted joint capsule, or scar can increase in extensibility. Heat alone does not have this effect.

Patients suffering from joint stiffness due to non-inflammatory arthritis or degenerative joint disease will often find heat temporarily palliative.

Like cold, heat can be used to alleviate pain. Muscle spasm caused by ischemia may be relieved by heat, which increases blood flow to the area of injury. Inflammation and swelling are decreased through some of the direct effects of heat application such as increasing metabolism, reducing oxygen tension, lowering pH level, increasing capillary permeability, and releasing histamine and bradykinin (thereby causing vasodilation).

CONTRAINDICATIONS AND PRECAUTIONS

Contraindications

1. Applying heat immediately after an injury
2. Acute conditions or acute exacerbation
3. Areas with no sensation
4. Regions with decreased arterial circulation
5. Over the eyes or genitals
6. Over the abdomen during pregnancy
7. Late stages of Diabetes Mellitus
8. Over active infection.

Precautions

1. Areas where there is hemorrhaging
2. Decrease in normal circulation
3. Areas with decreased sensation

PREPARING THE MODALITY

General Considerations

Moist heat versus dry heat- Moist heat causes a greater indirect increase in the deep tissue temperature than does dry heat, but dry heat is tolerable up to higher temperatures than is moist heat. Although the skin surface will rapidly increase in temperature during a superficial heat treatment, the underlying tissues such as joints and muscles will increase very little because skin is a poor thermal conductor. The subcutaneous fat acts as an insulator against dry heat, plus increased circulation to the skin quickly carries away the heat. Therefore, duration of heat application and effectiveness are a function of the



anatomical site being treated. For example, the wrist or hand is more easily penetrated by heat than would be the low back.

PREPARING THE PATIENT

Patient feedback is the best monitor of whether heat treatment is dangerously hot. Patients must be informed before the treatment that if the modality becomes uncomfortably hot, they should inform the clinician immediately. If the clinician is not present during the entire application of the modality, the patient should be provided with an alternative method to notify an appropriate individual if the modality becomes uncomfortably hot.

Because heat is immediately palliative, it is often used inappropriately as a home remedy for aches and pains stemming from a wide variety of origins. However, heat may actually have a negative effect on the patient a few hours following application, particularly in patients with acute conditions. Patients should be asked to monitor their symptoms later on in the day after heat application at home and in the office. If they experienced increased stiffness, achiness or pain, heat may have caused an adverse reaction and alternative treatments should be considered. Since patients may perceive heat differently, the clinician should visually monitor the region during and after treatment for adverse effects.

TECHNIQUES OF APPLICATION

Moist heat packs

Also called Hydrocollator packs, are kept in water at 170°F (76.7°C) and will retain this level of heat for 20 to 30 minutes following removal from the water. A minimum of 6 layers of toweling (or its equivalent) is used between the packs and the skin; more are added according to patient's comfort. The pack will reach its hottest point approximately 7 to 10 minutes into the treatment. The patient should not lie on the pack, because the trapped heat can cause burning.

Treatment time: 10 - 20 minutes

Mode of heat transfer: Conduction

Penetration: ¼ - ½ inch

Application Procedure:

- Step 1: Wrap the equivalent of 6 layers of toweling around the hydrocollator pack.
- Step 2: Place on treatment area. Be sure the treatment area is free of any metal clasps, chains, or jewelry. Metal will absorb and conduct heat faster and could potentially lead to burns.
- Step 3: Patients will feel the full effects of the heat at about 7 - 10 minutes; ask them if the temperature is comfortable.

Post-treatment procedures

Check the patient's skin following treatment for any adverse reaction that may have occurred. Have the patient monitor their symptoms later in the day for any increased stiffness, achiness, or pain.



Warm whirlpool bath

(Caution should be used for patients with heart conditions, hypertension, or diabetes).

Is a combination of massage and water immersion. Tanks can be full body, extremity only or lower body only. This modality is especially useful when the body part is moved actively during the treatment.

Temperature should be: 98° to 110°F (37 - 45°C) for treatment of the arm and hand
98° to 104°F (37 - 40°C) for treatment of the leg
98° to 102°F (37 - 39°C) for full body treatment

Precautions in whirlpool treatment are light-headedness when using full body pool and the risk of spreading infection in improperly maintained whirlpools. Electrocutation is a concern; the patient should therefore never turn off the motor.

Treatment time: 15 - 20 minutes

Mode of heat transfer: Convection

Penetration: ¼ - ½ inch

Application Procedure:

Step 1: Fill whirlpool to desired level and temperature.

Step 2: The clinician, NOT the patient, should turn on the whirlpool motor (direct flow should be 6 – 8 inches from body part).

Step 3: Have patient enter the whirlpool tub.

Step 4: Monitor patient for heat tolerance and light-headedness.

Step 5: The clinician, NOT the patient, should turn off the whirlpool motor.

Post-treatment procedures

Check the patient's skin following treatment for any adverse reaction that may have occurred. Have the patient monitor their symptoms later in the day for any increased stiffness, achiness, or pain.

Paraffin bath

(Caution: There should be no open wounds, rashes, or acute episodes of inflammatory arthritis in the treatment area).

An effective heating modality for the distal extremities, however, it must be noted that the risk of burn can be substantial. The paraffin provides six times the heat that is in water because of the lowered melting point due to the mineral oil in the product. This mixture contains a ratio of 2 lbs of paraffin wax to 1 gallon of mineral oil. This is an especially effective treatment in chronic injuries to the hands, wrists, elbows, ankles, and feet. Temperature of paraffin baths should be maintained at 126°F (52°C).

Treatment time: 20 - 30 minutes

Mode of heat transfer: Conduction

Penetration: ¼ inch



“Dip and Wrap” Application Procedure:

- Step 1: Remove any jewelry from the area, clean thoroughly (to reduce contamination of wax) and dry completely (water on the skin burns the patient).
- Step 2: Dip the extremity into the bath and remove, giving the wax time to turn from shiny and clear to a dull white.
- Step 3: The patient should not move the extremity between dips; cracks in the wax allow melted wax to seep in, which is uncomfortably hot for the patient.
- Step 4: Subsequent dips into the bath should not be as deep as the first time, so new wax is not coated against the skin; dip the extremity a total of 6 times.
- Step 5: Wrap the extremity in plastic immediately following the last dip to better retain the heat. Wrap again in towel for further insulation for 20 – 30 minutes.
- Step 6: Wax is then removed and discarded/returned to wax tub.

Post-treatment procedures

Check the patient’s skin following treatment for any adverse reaction that may have occurred. Have the patient monitor their symptoms later in the day for any increased stiffness, achiness, or pain.

Fluidotherapy

Despite the name, does not use fluid to heat the tissues. This is a dry-heating modality that consists of cellulose particles circulated by hot air. Because this unit uses dry heat transferred by convection in a suspended airstream, patients can tolerate a much higher temperature than they would with either paraffin wax or moist heat. However, this is still a superficial heat therapy.

Effects of fluidotherapy include general heating effects, plus micromassage, levitation, and stimulation. Exercise during the treatment can help increase the range of motion and ability to perform. Indications and contraindications are the same as other heating modalities.

Recommended temperature varies by body part and patient tolerance, with a range of 110° to 125°F (43 - 53°C). Maximum temperature rise occurs after 15 minutes of treatment.

Treatment time: 15 – 20 minutes

Mode of heat transfer: Convection

Penetration: ¼ inch

Application Procedure:

- Step 1: The patient’s extremity is inserted into an enclosed port location either at the side or top of the unit
- Step 2: Temperature of the modality is set between 110° to 125°F
- Step 3: Particle agitation/blower intensity should be set at the patient comfort level

Post-treatment procedures

Check the patient’s skin following treatment for any adverse reaction that may have occurred. Have the patient monitor their symptoms later in the day for any increased stiffness, achiness, or pain.



Reference Consulted

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

Jaskoviak, Paul A., Schafer, R.C., Applied Physiotherapy. The American Chiropractic Association. 1993.



PATIENT INSTRUCTIONS FOR THE USE OF SUPERFICIAL HEAT

WHEN IS HEAT THERAPY USED?

Heat is applied to an area, such as an old injury, to decrease tension, joint stiffness, pain, and muscle spasm.

WHEN SHOULD HEAT NOT BE USED?

Heat should not be used for acute or new injuries. In general, that means that heat should not be used over a new injury until at least 72 hours after the injury. Because the detrimental effects of heat are not felt until hours after use, the connection may not be traced back to the heat. When in doubt, contact your doctor of chiropractic for advice.

WHY IS HEAT THERAPY USED?

Heat increases blood flow and has immediate soothing effects.

HOW DO I APPLY HEAT THERAPY?

Moist heat is preferable to dry heat, because moist heat will penetrate deeper into the tissues. Moist heat can be obtained by using a hot, wet towel with a hot water bottle or heated gel pack over it, or by purchasing a heating pad that has a special insert for a hot towel.

1. Place a towel, then the hot pack, over the area to be treated. Do not lie on the heat.
2. The full effects of heat are felt after about 10 minutes, but the full treatment time is 15 minutes.
3. If the temperature is not tolerable, an extra layer of towels should be applied under the pack.
4. If necessary, heat can be reapplied after a 60-minute wait between applications to allow the temperature of the injured tissue to return to normal.