HOT APPLICATION

Hot application means the applications of an agent warmer than the skin. Heat is applied in either a moist and dry form.

PURPOSES:-

- Heat decreases pain
- To provide comfort
- To provide circulation
- To promote suppuration
- To relax muscles
- To promote healing
- To relieve deep congestion
- To soften the exudates
- To stimulate peristalsis
- To counteract sudden drop in temperature
- To decreases joint stiffness
- To relieve bladder distension

CLASSIFICATION

- Local heat application
- Dry heat:- Infrared rays, UV rays, lamps, electric heating pads
- Moist heat:-Warm soaks, hot fomentations, sitz bath,
- Whirlpool etc

PHYSIOLOGICAL EFFECTS OF HOT APPLICATIONS

- Peripheral vasodilatations
- Increases capillary permeability
- Increased local metabolism
- Increased oxygen consumption
- Blood flow is increased
- Blood viscosity is decreased
- Motility of leukocytes is increased
- Muscle tone is decreased

CONTRAINDICATIONS TO HOT APPLICATIONS:-

- Heat is not used because heat increases the metabolism
- Heat is not used for the patients with impaired kidney, heart and lung.
- Heat cannot be applied to acutely inflamed areas
- Heat can’t be applied if the patient is having paralysis and debilited patients
- Heat can’t be applied for the patients with open or closed wounds.
- Heat can’t be applied if the patient is having edema all over the body.

PRINCIPLES OF HOT APPLICATIONS

- Heat causes dilation of the blood vessels and increases
- the blood supply to the area
- Heat stimulates metabolism and the growth of the new cells and tissues.
- The end organs of the sensory nerves in the skin covey the sensation are interpreted in the brain
- water is a good conductor of heat
- The flow of heat is from the hotter area to the less hot area.
- Presence of stream increases the temperature of the hot applications
- The temperature tolerance varies with individuals and according to the site and the area covered.
- Friction produces the heat.

COMPLICATIONS

- Pain
- Burns
- Macerations
- Redness
- Oedema
- Hyperthermia
- Pallor

GENERAL INSTRUCTIONS

- Protected damaged skin layers exposed layers of the skin are more sensitive to temperature variations than skin layer.
- Check a patient frequently during hot applications the condition of the skin indicates whether tissue injury is occurring
- Do not allow a patient to adjust temperature settings.
- Never position the patient in such a way that he cannot move away from the temperature sources. This avoids the risk of injuries from temperature exposure.
- Never ignore the complaints of a patient however small they appear to be.

HEAT CREAMS AND OINTMENT

- These popular over-the-counter remedies can provide relief from minor muscle pain. However, these topical treatments do not penetrate very deeply into muscle tissue, making them less effective in treating more significant pain.

WARM COMPRESSES AND HOT PACKS

- Moist heat packs are made of silica gel and are considered a superficial heating modality. Heat packs are fairly convenient and are kept in a hydroculator. Larger heat packs should be used for areas such as the low back or quadriceps, while the smaller, longer ones should be used for the cervical area. The temperature should range from 145-170°F. These packs should be used for 15-20 minutes, and be placed

in a cloth pad to protect from burns. Additional towels may be necessary. The patient should try to avoid lying on the heat pack, and should be in a comfortable position

- Hot packs are heated, cloth-covered pouches with a core of silica gel. They provide relief of pain located in a patient's trunk, spine or limbs. Hot packs also are used to treat muscle spasms, and the inflammations of tendonitis and bursitis. Variations of this type of therapy include hot water bottles, warm and moist compresses and electric heating pads.

PARAFFIN BATH

- Paraffin (waxy white or colourless solid hydrocarbon mixture used to make lubricants) is mixed with mineral oil in a special basin into which the affected limb is immersed. This treatment can provide relief of arthritic symptoms. These units can also be bought for use at home.
- Paraffin dips use a mixture of oil and water to heat an area usually irregular in shape and somewhat small, such as a hand. The temperature ranges from 118 to 126°F. It is fairly inexpensive but not too convenient. Paraffin baths are generally used for arthritis and other chronic inflammatory conditions. There are two common methods for use:

IMMERSION BATH

- The patient dips the body part in the wax and removes it so that it dries, then re-dips 6-12 times while allowing it to dry between dips. Then the patient immerses the body part for 5-10 minutes, with care being taken to avoid busning

PACK GLOVE METHOD

- This method is safer than the immersion bath because there is less chance of burning. With this, the patient dips the body part in the wax and lets it dry. This is repeated 7-12 times. After the last dip, the body part is covered with a plastic bag and then a heat pack is placed over the injury to keep it in the heat.

WARM WHIRLPOOL BATHS

- Like the cold whirlpool, it is expensive and inconvenient to use a warm whirlpool. Despite this, it is good for covering large, irregular surface areas. The temperature should range from 105 to 110°F, and the duration of treatment should last from 15 to 20 minutes. If the core body temperature gets too high, hyperthermia should become a concern. Whirlpool baths promote vasodilation and help stretch collagen tissue.

Ultrasound Therapy

- A method of applying deep heat to tissues using high-frequency sound waves. Transmission gel, oil or water is applied to the skin covering certain areas of the body. Energy derived from a quartz crystal is then the passed from an applicator through the gel, creating deep heating to soft tissue and bone that increases blood flow and tissue metabolism and raises a patient's pain threshold.
- Ultrasound is a form of acoustic energy utilized for its thermal and non-thermal effects. To deliver these acoustic waves, there is an instrument with a metal faceplate

containing quartz crystals inside. When mechanically altered, they produce an electric output. Therapeutic ultrasound has been used to stimulate the repair of soft tissue injuries and to relieve pain.

- For thermal effects to occur, energy must be absorbed. One wants to attain a deep penetration of the heat, with the optimum depth of penetration being 3-5cm (as opposed to a heat pack, which heats only2cm deep). Non-thermal effects include micro massage (microscopic movement of fluids and tissues), which leads to an increase in membrane permeability and arterial vasodilatation and constriction. The indications for thermal and non-thermal ultrasound are quite different, but the precautions are the same.
- Avoid: Areas with decreased sensation and circulation Eyes, oesophagus, reproductive areas Using during pregnancy On cancer patients On those with a cardiac pacemaker.
- Clinical applications of therapeutic ultrasound include: Inflammation: Acute and sub acute phases
- Utilized at low intensities to promote absorption of proteins
- Decreased risk of poor structural formation of collagen (scar tissue) Pain and Nerve Conduction:
- Ultrasound selectively heats peripheral nerves, and alters or blocks impulse conduction and increases membrane permeability May block pain mechanism through effecting nerve
- **Circulation:**
  Improved local circulation
- The heating effect occurs when the ultrasound is on continuously. For non-thermal effects, one should be aware of the duty cycle, which represents the on and off time of the ultrasound. In the case of pulsed ultrasound, the duty cycle may be 20%, 40%, 50%, etc. In the case of 20% duty cycle, the ultrasound is only on 20% of the time. For acute injuries, the setting should be 20-50%. For sub acute injuries, the duty cycle should be 50-80% to aid in the change-over to heating modalities.
- For both thermal and non-thermal ultrasound, the following are appropriate intensities: acute – 0.1-0.5 watts/cm2, sub acute – 0.5-1.0 watts/cm2, chronic – 1.0-1.5 watts/cm2. All treatments should last 5 minutes.
- When applying therapeutic ultrasound, a transmission gel should be used to produce better conductivity. It is important to use a small, circular pattern while keeping the ultrasound head in constant contact with the area. This maintains a high coupling effect, which will allow the patient to receive the greatest benefits.
- Ultrasound can also be transmitted through water in cases where the area being treated is irregular in shape or the faceplate is too large to accommodate the area. The patient sticks the area in a bucket of water while the therapist holds the faceplate just under the surface of the water, 2 inches above the area being treated. An important point to keep in mind is that 60% of the ultrasound intensity is lost through water. So the intensity level needs to be increased to account for this.
- When turning the ultrasound on, the ultrasound head must be kept in contact with the gel or water. This helps prevent the crystals inside the head from shattering.

Diathermy

- This is a treatment using microwaves or short waves which are selectively absorbed by tissues with high water content. Microwave therapy is especially helpful for patients who have sprains, strains, herniated discs, rotator cuff tears or arthritis. Shortwave therapy is often used to treat low back pain, tenosynovitis (inflammation of a tendon sheath) and osteoarthritis of the knee.
- Some forms of electrical therapy also provide a thermal effect.
- Many people use forms of thermotherapy at home to treat minor conditions, such as a hot pack applied to a stiff neck.
- Thermotherapy can be used to treat a number of pain conditions. These include: (Chronic) muscle spasm. Persistent and often painful tension and shortness in a muscle or group of muscles that cannot be released voluntarily. Arthritis. Inflammation of a joint. Types of arthritis that may benefit from thermotherapy include: Sub acute or chronic inflammatory conditions
- Osteoarthritis
- Rheumatoid arthritis
- Juvenile arthritis
- Juvenile rheumatoid arthritis
- Ankylosing spondylitis
- Gout
- Psoriatic arthritis
- Reiter's syndrome
- Sources of back pain, such as a herniated_disc. A frequently painful condition in which the cartilage (the tough, elastic, fibrous connective tissue) of an intervertebral disc (discs that serve as cushions between the vertebrae) bulges through its protective covering and presses on a nerve. Most of the time a herniated disc is associated with overlying muscle spasm, which heat therapy decreases.
- Whiplash and other musculoskeletal types of neck pain.
- Shoulder pain, such as rotator cuff injuries. Decreased range-of-motion. The rotator cuff is made up of the muscles and tendons that connect the humerus to the shoulder blade. Tendons in the rotator cuff are normally strong, but they can become inflamed and tear as a result of overuse, wear and tear associated with aging or an accident such as a collision. Another condition that may be eased by application of heat is a frozen shoulder.
- Other types of joint pain, including many forms of: Arm pain (e.g., tennis elbow), Leg pain (e.g., restless leg syndrome), Knee pain (e.g., injured anterior cruciate ligament) Foot pain (e.g., plantar fasciitis) Tendonitis. Inflammation of a tendon, a fibrous tissue connecting a muscle with its bony attachment.

- Bursitis. Inflammation of a bursa, a sac located between a tendon and a bone.
- Sprain. A painful wrenching or laceration of the ligaments of a joint.
- Eye pain. An ophthalmologist or other clinician may suggest applying warm compresses to relieve minor conditions such as blepharitis (inflammation of the eyelids).
- TMJ disorder. Applications of heat may help tender areas.
- Chest pain. Heat can supply relief from disorders such as costochondritis.

- Abdominal pain and pelvic pain. Researchers have found that externally applied heat such as hot-water bottles can relieve even deep internal pain for up to an hour by blocking pain receptors.
- Fibromyalgia. Therapeutic use of heat may help treat this chronic pain condition, characterized by musculoskeletal aches, Lupus is a chronic autoimmune disease that can cause joint pain and inflammation (arthritis).pain and stiffness, tenderness in soft tissues, general fatigue and sleep disturbances.
- Other chronic pain disorders, including lupus and myofascial pain syndrome.
- Asthma
- Sub acute and chronic pain
- Reduction of joint contractures.
- Other conditions that may be treated with heat include back strain or sprain, degenerative disc disease, sciatica and scoliosis, as these conditions are usually associated with muscle spasm.
- Heat can also be used as a minimally invasive alternative to surgery. For example, several treatments for benign prostatic hyperplasia use microwaves, lasers or other sources of heat to destroy excess prostate tissue. High-intensity heat is also used to destroy some types of benign and cancerous tumours.
- In addition, thermotherapy is used to reduce spasticity in neurological conditions. Recent studies indicate that a combination of thermotherapy and cryo-therapy may help stroke patients recover arm function and may ease symptoms in people with heart failure. Other recent research suggests that a microwave form of thermotherapy might benefit women with advanced cervical cancer.

Counter-Indicators and Warnings

- Hot applications such as hot immersion baths, full body heating treatments and hot saunas should be taken with precaution by patients with diabetes, multiple sclerosis, women who are pregnant (this exposes the foetus to prolonged heat) or anyone with abnormally high or low blood pressure.
- Contraindications for thermotherapy also apply for acute injuries, circulatory problems in general, poor thermal circulation and areas of the body that are anaesthetic.
- Thermotherapy generally should not be used during the first several days after an injury, because heat increases blood flow and may worsen swelling. Heat treatments are inappropriate for some individuals and conditions. For example, people who have impaired sensation (e.g. From neuropathy due to diabetes) are at risk of burns from overuse of thermotherapy.
- Heat therapy should not be used on tissue that has received radiation treatment or on tissue that is directly over a cancer site.

MECHANISM OF ACTION, AND INDICATIONS

- Heat creates higher tissue temperatures, which produces vasodilatation that increases the supply of oxygen, and nutrients and the elimination of carbon dioxide and metabolic waste.
- Heat therapy is useful for muscle spasms, myalgia, fibromyalgia, contracture, bursitis

- Because heat is a vasodilator, it should be avoided in tissues with inadequate vascular supply, in case of acute injury, in bleeding disorders (because heat would increase bleeding), in tissues with a severe lack of sensitivity, in scars.
- Another use is the treatment of infection and cancers by the use of heat. Cancer cells and many bacteria have poor mechanisms for adapting to and resisting the physiological stresses of heat, and are more vulnerable to heat-induced death than normal cells

Hot	**37.7°C-40.5°C**	**I00°F-I05°F**
Warm	35°C-37.7°C	95°F-100°F
Tepid	26.6°C-35°C	80°F-95°F
Cool	!8.3°C-26.6°C	65°F-80°F
Cold	!0°C-!8.3°C	50°F-65°F
To convert Fahrenheit to Celsius: C		= (F – 32) X 5/9
To convert Celsius to Fahrenheit: F		= (C X 9/5) + 32

COLD APPLICATION:

INTRODUCTION:

There are numerous methods which can be used to apply different forms of cold therapy. Which one to use will depend on the body part to be cooled and the type of injury present?

Purpose of the local cold application

- To relieve the pain, burning and irritation
- To control the bleeding
- To prevent gangrene by decreasing the tissue metabolism.
- To prevent the reduce inflammation and oedema.
- To inhibit the bacterial growth and prevent suppuration.
- To reduce the body temperature
- To anaesthetize an area for short period

Types of cold application

Various types of cold application

Ice bags and Ice collar, Cold compress, cold packs, general cold moist application-cold sponging, hypothermia.

Dry cold application Moist cold application

(ice bags, ice pack (compresses, soaks, packs hypothermia blankets,) cold sponging

COLD COMPRESS:

This is the local moist cold application made out of folded layers of gauze, lint pieces or old soft linen. The gauze is cooled over ice chips, wrung out and they applied to any part of the body surface.

It is replaced as it becomes warm.

A cold compress is used to cool an injured area, which protects body tissue by slowing metabolic rate and reducing swelling around the injury.

THINGS NEEDED:

Washcloth or face towel or any clean piece of cloth. The size should be proportionate to the area to be treated. For convulsions use bath towels.

- A basin of ice water, 2/3 full.
- One bath towel.
- A kidney tray
- A small mackintosh and towel to protect the bed

PROCEDURE:

1. Explain the procedure to the patient
2. Carry equipment to the bed side and screen the patient, if necessary
3. Wring (squeeze) compress cloth from ice water. Be sure it does not drip.
4. Apply snugly (very well) on the area to be treated.
5. Change or renew compress every 2-3 minutes.
6. Treatment time: for decongestion-20-30 minutes; for fever –continuously, for as long as there fever.
7. At the end of the procedure, dry body part thoroughly with the towel and avoid chilling.
8. On completion of the treatment remove and clean the equipments and replace to proper places
9. Comfort the patient and documentation
10. Special points to remember
11. Do not cover a cold compress, as it would soon reach body temperature.
12. Apply cold compress for 15 - 20 minutes at a time
13. Observe for numbness and mottled bluish appearance.
14. Local effects of the cold compresses:
15. It lowers the temperature of the skin and underlying vasoconstriction
16. It decreases the capillary permeability
17. Slow bacterial growth
18. Decrease inflammation
19. Local anaesthetic effects
20. Systemic effects of the cold compresses
21. Excessive cold application-Vasoconstriction
22. Increase of blood pressure, decrease blood flow, decreases lymph flow, decrease motility of leukocyte, decrease muscle tone
23. Prolonged cold application- shivering , decreases local metabolism, decreases oxygen consumption, increases blood viscosity,
24. In cold application the primary effects may last for 30 to 1 hour. After this time a recovery time of 1 hour must be allowed or secondary effects vasodilatation will take place.

Temperature for hot and cold application

Description	Temperature	Application
Very cold	Below 15^0c	Ice bags
Cold	15-18^0c	Cold packs
Cool	18- 27^0c	Cold compresses
Tepid	27-37^0c	Alcohol sponge bath
Warm	37-40^0c	Warm bath
Hot	40- 46^0c	Hot soak/ hot compress

THERAPEUTIC USE OF LOCAL COLD APPLICATION

INDICATION OF THE LOCAL COLD APPLICATION

- **Sprain and fractures**
- **Localized haemorrhage**: nose bleeding and hematomas
- Localized wound, insect bites, minor burns, after injection
- Headache, muscle spasm, pain due to malignancy.
- Low and moderate pyrexia
- Dental extraction and surgical repairs
- **Cold relives pains**: it decreases nerve impulse conduction, relives spasm of the arterioles, prevents congestion e.g. sprain
- **Prevents gangrene**: it decrease tissue metabolism, decrease the effects of tissue anoxia(lack of oxygen) and there by delays tissue necrosis
- Prevent oedema and reduces inflammation:
- Decrease circulation and prevent fluid congestion: e.g in sprain
- **Control haemorrhage**: it causes vasoconstriction and increases blood viscosity which helps in blood coagulation of blood and checks haemorrhage
- **Checks the growth of bacteria**: cutaneous application of the cold reduces the tissue temperature and makes the environment less favourable for the growth of the microorganism
- **Decreases the body temperature**: heat withdrawn from the conduction, convection, and evaporation
- **Cold anaesthetize an area:** decreases the sensitivity of the tissue and create a sensation of numbness thus it can be used a local anaesthesia for short period

Contraindication to the use of cold compresses

- Open wound (cold can increase tissue damage by decreasing blood flow to an open wound)
- Impaired circulation(cold can further impair the nourishment of the tissue
- Allergy and hypertensive to cold application
- Some people react by decreasing blood pressure
- Inflammatory response(swelling, joint pain)

ICE BAG AND ICE COLLAR (LOCAL DRY COLD):

Ice bags, ice collar or ice cap are commonly used for applying dry cold to the body. Ice collar is a long narrow rubber or plastic bag, which fits around the neck. The bags are usually made with an opening through which small pieces of ice are inserted.

Articles required ice bag/ice cap/ice collar

Articles	Rational

A big bowl	To keep ice cubes
An ice bag with cover	To provide cold application
A mackintosh with towel	To protect the beds
A role of tape or bandage	To secure the bags
A small container with salt	To sprinkle on ice
A small spoon	To take ice pieces from the bowl
A duster	To wipe the bag after filling
A small ice cubes	To fill in the bag
A kidney tray and paper bag	To discard wastes

STEPS OF ICE CAP /BAG APPLICATION

1. Place the patient's injured body part above the heart:

If possible. If it's not possible, elevate the injury as much as possible while still allowing the patient to rest comfortably. Cold compression and elevation work together to prevent the injured area from swelling, which can be both painful and harmful to the damage tissue.

2. Prepare the ice bag/pack/cap/collar.



- Make an ice pack by wrapping ice in a small towel or cloth, or by filling a plastic bag with ice. You can also use a large bag of frozen vegetables as an ice pack. The best ice pack is created by filling a commercially available ice bag specifically designed to be used as a cold compress.
- Use a commercially available cold pad that has been stored in the freezer. The pad may be filled with gel or small pellets which remain cold for an extended time after being removed from the freezer.
- Activate a chemical cold pack by breaking the inner bag of chemicals. This allows the chemicals in the inner bag to mix with the chemicals in the outer bag, creating an endothermic reaction that will make the pack cold

3. Gently place the cold compress on the injured area, making sure to completely cover the area, or rest the injury on top of the cold compress.

- Make sure that you keep a cloth or bandage between the cold compress and the patient's skin. If you apply a homemade compress such as a bag of ice directly to the skin, it can cause frostbite. Many commercially available compresses include a thick outer covering that protects the skin.
- The patient may need to hold the compress in place, depending on the location of the injury. You can also use a large bandage to hold the compress in place.

4. Improve contact between the cold compress and the skin by wrapping a bandage around the compress and the injured area.: Don't wrap the bandage tightly, as doing so may cut off the blood supply to he injury and to cause the patient pain.

5. Remove the ice bag application after 20 minutes: to prevent the skin from becoming frostbitten

If using a chemical cold pack, discard it after use.

6. **Reapply a cold compress after 2 hours**.

Alternate 20 minutes with the compress with 2 hours without the compress for 3 days or until the swelling completely subsides.

If the swelling is severe, you can reapply the compress after only 30 minutes for the first 1-2 hours after the injury occurs

TEPID SPONGE:

Tepid means lukewarm, or room temperature not hot but not cold. This is likely talking about a sponge moistened with water at this temperature. Tepid sponge bath is considered as one of the best cooling treatments. This method is recommended for febrile individuals, especially those with fever ranging from 102.2 F or higher. It is effective in relieving fever by reducing high temperature and also helpful in alleviating pain or discomfort

REQUIRED EQUIPMENTS

Bath basin, several washcloths, towels and a bath, big bowl

INSTRUCTIONS

1. Assess the condition of your patient. This data will serve as a basis in evaluating the patient's response to the treatment.
2. Explain the method to the patient or the watcher. By providing them some information about the procedure, it will be much easier for them to cooperate.
3. Bring all equipments and set them on the area near the bed. Carefully check all of your materials to make sure everything are there.
4. Wash hands thoroughly before starting the procedure.
5. Close the door or the partition sheets (if at the ward) to provide privacy.
6. Adjust the patient's bed on a certain height that is accessible for working. This is beneficial on your side as it protects you from straining your back.
7. Place the bed protector or rubber sheet on patient's bed to protect bed linens
8. Put on your working gloves. This prevents transmission of contaminants.
9. Carefully remove patient's clothing and place the bath blanket on top of him to ensure privacy.
10. Fill in your basin with cold water and mixed it up with hot water. Make sure to check its temperature. It should be neither too hot nor too cold. Appropriate temperature is 27 to 37 degrees C.
11. Immerse or dip small towels in the lukewarm water. Squeeze it to avoid dripping, and gently apply on the forehead, the axilla or armpits and the groin area. Do this for about 20 to 30 minutes and repeat if necessary. Heat transfer is much more effective when compresses are applied on areas with large superficial blood vessels such as the axillary and groin areas.
12. Carefully wipe the patient's extremities for about five minutes. Then proceed with back area and buttocks for about five to 10 minutes. Abdomen and chest areas are usually not included.
13. Monitor the patients' response to the treatment by checking his temperature. If it is slightly above normal, discontinue the procedure.
14. Replace the patients' clothing and cover him with a light sheet. As much as possible, avoid letting your patient wear heavy clothing or excessive sheet covering as it will only elevate his temperature.
15. Now begin after care by doing the following: change bed linens and remove the equipments away from the bed to prevent transmission of microorganisms, lower the patient's bed back to a safer height, Remove gloves, and wash your hands thoroughly.
16. Document the procedure done, along with the patient's vital signs, response to treatment, and complications if any.

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