INFRARED Therapy

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Objectives

Following completion of this lecture the student must be able to:

Understand how the infrared radiation is classified in the electromagnetic spectrum.

Describe the physiological effect of infrared radiation.

Describe the indications and contraindications of infrared radiation.

Explain how the therapist can use the infrared radiation.
Outlines

- Definition and classification (types).
- Sources and production.
- Physiological and therapeutic effects.
- Indications and contraindications.
- Dangers/Precautions
- Practical and clinical application
What is Infrared?

Infrared radiations are part of an electromagnetic spectrum, with wavelength of 750nm-1mm, and frequency of $4 \times 10^{14}$ and $7.4 \times 10^{11}$, and located between microwave and visible light.

Infrared is superficial Heating modality (penetration depth 1-10mm). Infrared is radiant heat transmits energy by radiation.
Source and types

Sources of IR

Artificial

Natural

Luminous

Non-luminous

Sun (IR=60%)

Near IRR

Far IRR
### I-Classification IR

<table>
<thead>
<tr>
<th>Near (short)=750-1500nm</th>
<th>Far (long)=1500-15000nm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Types</strong></td>
<td></td>
</tr>
<tr>
<td>IRA=750-1400nm</td>
<td>IRB=1400-3000, IRC=3000nm-1m</td>
</tr>
<tr>
<td><strong>Source</strong></td>
<td></td>
</tr>
<tr>
<td>Luminous heated body</td>
<td>Non-luminous Heated bodies</td>
</tr>
<tr>
<td>-Incandescent bodies</td>
<td>-Hot pack</td>
</tr>
<tr>
<td>-Sun</td>
<td>-Electrical heating pads</td>
</tr>
<tr>
<td>-Tungsten</td>
<td></td>
</tr>
<tr>
<td><strong>Penetration</strong></td>
<td>Superficial; penetrates to the epidermis ≤5mm</td>
</tr>
<tr>
<td>Deeper; penetrates to epidermis, dermis &amp; subcutaneous (5-10mm)</td>
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</tr>
<tr>
<td><strong>Absorption</strong></td>
<td></td>
</tr>
<tr>
<td>Deep</td>
<td>Superficial</td>
</tr>
<tr>
<td>Luminous versus non-luminous IR</td>
<td></td>
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<tr>
<td>---------------------------------</td>
<td></td>
</tr>
<tr>
<td>Sources &amp; types</td>
<td>Luminous</td>
</tr>
<tr>
<td></td>
<td>Electrically heated filament</td>
</tr>
<tr>
<td></td>
<td>• Quartz lamp,</td>
</tr>
<tr>
<td></td>
<td>• Tungsten lamp,</td>
</tr>
<tr>
<td></td>
<td>• Carbon filament lamp</td>
</tr>
<tr>
<td>wavelength</td>
<td>350-4000nm (maximum 1000nm)</td>
</tr>
<tr>
<td>Emission</td>
<td>70% near IRR, 24% far IRR,</td>
</tr>
<tr>
<td></td>
<td>5% visible light, &amp; 1% UV</td>
</tr>
<tr>
<td>Penetration</td>
<td>Epidermis, dermis &amp; subcutaneous tissue (5-10mm)</td>
</tr>
<tr>
<td>Uses</td>
<td>Chronic inflammation</td>
</tr>
<tr>
<td>Physiological effect</td>
<td>Pain reduction via counter-irritant effect</td>
</tr>
<tr>
<td>Treatment time</td>
<td>15-20minutes</td>
</tr>
<tr>
<td>Distance</td>
<td>40-60cm from treated area</td>
</tr>
</tbody>
</table>
Factors Regulating Absorption & Penetration of IR

- Infrared radiations striking the surface of the skin will be reflected, scattered, refracted, penetrate and absorbed in the tissues. The depth of penetration and absorption of IR depends on:

  1. Frequency of radiation
  2. Thermal conductivity of the tissue
  3. Thickness of tissue.
  4. Cosine law.
  5. Arndt-Schultsz principle
  6. Grotthous Draper law
  7. Inverse square law
  8. Vascularity of tissues
  9. Types of the skin
Physiological Effects of IRR

**INCREASE**
- Local temperature superficially
- Local metabolism
- Capillary permeability and blood flow
- Lymphatic and venous drainage
- Vasodilatation of arterioles and capillaries
- Leukocytes& phagocytes activity
- Axon reflex activity
- Stimulation of sensory nerve

Vasodilatation starts after 1–2 minutes and lasts for 30 minutes.
Erythema: is of irregular patchy red appearance of skin (lasts for about 30 minutes) after IR application.
Therapeutic Effects and Indications

1- Relief of pain & muscle spasm.
   - Mild heating has a 'sedatory' effect on sensory nerves endings used for the relief of acute pain.
   - Strong heating has a ‘counter irritant’ effect on sensory nerves endings and used for the relief of chronic pain.

2- Prior to other Treatments: (e.g. stretching, mobilization, traction, massage, exercise therapy, electrical stimulation, and biofeedback).

3- Increased blood flow and circulation (e.g. reduce chronic edema)

5- Muscles relaxation

6- Increase healing of tissue (no more recommended)
Contraindications and Precautions of IR

- Acute inflammatory conditions
- Impaired cutaneous thermal sensation and circulation
- Peripheral vascular disease
- Markedly loss of consciousness.
- Acute skin disease, e.g., dermatitis or eczema
- Deep X-ray therapy
- Defective blood pressure regulation
- Acute febrile illness (Fever)
- Tumors of the skin
- Hemophilia.

- Unreliable and elderly patients.
- Never apply heat directly to eyes or the genitals.
- Never heat the abdomen during pregnancy (first and last trimester)
Dangers side effects of IR

**Burn**
- Intensity of radiation is so high
- Loss of sensation,
- Reduce consciousness
- Unreliable patients
- Accidentally touch of hot element
- Metal & Inflammable materials in treated area,

**Dehydration**
- Lowering blood pressure & fainting
- Damage to the eyes
- Electrical shock

These dangers can be avoided by:
- Follow application principle
- Adequate warnings to the patient
- Checking the skin several times
Advantages vs. disadvantage

**Advantages**

- Can be used to treat large area, with local effect
- Easy of application (Patients can apply at home)
- Inexpensive

**Disadvantages**

- Heating only superficial tissue, therefore limited in use.
- Not effective as hot packs and paraffin wax
- Equipment is often unstable.
Practical and clinical application

Tips for Clinical application

- Select equipments
- Warm up
- Patients
- Lamp positioning
  - 40-90cm
- Dosage
- Follow-up

Luminous
- Luminous-No warm up
- Non-luminous – warm up 15 minutes

Indication/Contraindications
- Positioning /sensation

Follow-up