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 (IR) radiation

Infrared radiations (IR) are electromagnetic radiation with
- Wavelength of 750nm-1mm,
- Frequency of $4 \times 10^{14}$ and $7.4 \times 10^{11}$,
- Lies between microwave and visible light in electromagnetic spectrum.

IR is superficial Heating modality (penetration depth < 2cm)
IR transfers energy by radiation.
Source and production of IR

Sources of IR

Artificial

Luminous

Non-luminous

Natural

Sun (IR=60%)

Near IR (NIR)

Far IR (FIR)
# I-Classification IR

<table>
<thead>
<tr>
<th></th>
<th>Near (short) IR</th>
<th>Far (long) FIR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wavelength</strong></td>
<td>IRA/750-1400nm</td>
<td>IRB=1400-3000, IRC=3000nm-1mm</td>
</tr>
<tr>
<td><strong>Source</strong></td>
<td>Luminous heated body</td>
<td>Non-luminous Heated bodies</td>
</tr>
<tr>
<td></td>
<td>-Incandescent bodies</td>
<td>-Hot pack</td>
</tr>
<tr>
<td></td>
<td>-Tungsten</td>
<td>-Electrical heating pads</td>
</tr>
<tr>
<td><strong>Penetration</strong></td>
<td>Penetrates to epidermis, dermis &amp; subcutaneous (5-10mm)</td>
<td>Penetrates to the epidermis ≤5mm</td>
</tr>
<tr>
<td><strong>Absorption</strong></td>
<td>Deep relative to Far IR</td>
<td>Superficial</td>
</tr>
</tbody>
</table>

![Wavelength spectrum diagram](image)
## Luminous versus non-luminous IR

<table>
<thead>
<tr>
<th>Sources &amp; types</th>
<th>Luminous</th>
<th>Non-luminous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrically heated filament</td>
<td>• Quartz lamp, • Tungsten lamp, • Carbon filament lamp</td>
<td>Electrically heated resistance wire coiled. It takes about 5-15 minutes to be heated and emit their maximum intensity, e.g. electrical Hot pack</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wavelength</th>
<th>350-4000nm (maximum 1000nm)</th>
<th>1500-12000nm (maximum 4000nm)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Emission</th>
<th>70% near IRR, 24% far IRR, 5% visible light, &amp; 1% UV</th>
<th>90% far IRR, and 10% near IRR.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Penetration</th>
<th>Epidermis, dermis &amp; subcutaneous tissue (5-10mm)</th>
<th>Epidermis &amp; superficial dermis (2mm)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Uses</th>
<th>Chronic inflammation</th>
<th>Acute conditions.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Physiological effect</th>
<th>Pain reduction via counter-irritant effect</th>
<th>Pain reduction via sedative effect</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Treatment time</th>
<th>15-20minutes</th>
<th>20-30minutes (Why)</th>
</tr>
</thead>
</table>

| Distance | 40-60cm from treated area | 75-90cm from treated area |
Luminous versus non-luminous IR

https://youtu.be/lvRsU-X6_3w
**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 /wavelength /intensity 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
- Cutaneous vasodilatation
- Increase blood flow

**DECREASE**
- Decrease pain perception

**Vasodilatation**
starts after 1–2 minutes and lasts for 30 minutes.

**Erythema:**
is 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, 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

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

<table>
<thead>
<tr>
<th>Tips for Clinical application</th>
<th>Select equipments</th>
<th>Condition</th>
<th>Patients</th>
<th>Lamp positioning</th>
<th>Dosage?</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Luminous/non-luminous</td>
<td>Acute 10-15 minutes 3 time/ weeks</td>
<td>Indication/Contraindication</td>
<td>50-90 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IR Google /towels</td>
<td>Chronic 20-30 minutes, 3 time/ weeks</td>
<td>Positioning / sensation instructions and warnings</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Assignment 1

Please check the attached papers

Student will be grouped into 3 groups (3 in each)

Open discussion in the next class (20 minutes), the discussion should cover the following

Documentation including the following

1. Medical conditions (definitions/stages)
2. Area of Body affected and Tissue affected
3. Types of Infrared
4. Treatment parameters including
   - Temperature or power of agent (IR)
   - Distance of (IR) from patients
   - Patient position
   - Treatment duration/frequency
   - Response to intervention