ELECTROTHERAPY

MUSCLE STIMULATOR

- It have two types of current
  - Faradic current
  - Galvanic current

Faradic Current

- It is short frequency therapeutic current with frequency of 0.01ms to 1ms.
- It stimulates motor nerves & causes contraction of muscles.
- This current is not used in denervated muscle.

INDICATIONS

- Facilitate muscle contraction.
- Re-educate muscle action.
- Train new muscle action.
- Exercise for paralysed muscle
- Increase strength.
- Improves circulation.
- Improves adhesions.

CONTRAINDICATIONS

- Infections

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- Skin lesions
- Inflammation
- Thrombosis
- Markedlossofskinsensation
- Activetuberculosisorcancer
- Cardiacpacemaker
- Superficialmetal
- Unreliablepatient

GALVANICCURRENT

- It is long duration current ranging from 1ms- 300ms.
- It is used to stimulate denervated muscles.

INDICATIONS

- Used for iontophorisis.
- Stimulate denervated muscles.
- Prevent venous andlymphaticstasis.
- Improve local circulation

CONTRA-INDICATIONS

- Skinlesions.
- Infections
- Inflammation
- Thrombosis
- Markedlossofskinsensation
- Activetuberculosisorcancer
- Cardiacpacemaker
- Superficialmetal
- Unreliablepatients

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Ultrasound Therapy

Introduction

In ultrasound therapy ultrasound energy is used to treat human tissue.

The energy is applied through a transducer head which consist of a crystal that vibrates to produce energy.

PARAMETERS

Acute condition (thin skin): such as Forearms & on Ankle, 0.5 to 1.0 w/cm^2

Acute condition (thick skin) : such as the Thigh or buttocks, 1.0 to 1.5 w/cm^2

Chronic condition (thin skin): 1.0 to 1.5 w/cm^2

Chronic condition (thick skin): 1.5 to 2.0 w/cm^2

ULTRASOUND DOSE RANGE

Low Intensity : 0.1 to 0.8 w/cm^2

Medium Intensity : 0.8 to 1.5 w/cm^2

High Intensity : 1.5 to 3.0 w/cm^2

TREATMENT TIME

Acute condition : 4 to 6 minutes

Chronic condition : 6 to 8 minutes

Physiological Effects of Ultrasound Therapy:

An increase in tissue temperature and local metabolism

Softening of Tissues

An increase in local circulation

(1) **Chemical Reactions**:
Ultrasound vibrations stimulate the rate of chemical activity in the tissues much like shaking a tube in a laboratory.

(2) **Biological Reaction**:
Ultrasound alters the permeability of the cell membrane therapy enhancing the transfer of fluid and nutrients to the cells.
There is some evidence that ultrasound may increase the rate of healing of certain injuries which it is postulated may occurs through this biologic response.

(3) Mechanical Reaction:

- The high-frequency vibration of ultrasound deforms the molecular structure of the tissues.
- If the intensity of the sound wave is great enough the tissue may actually be irreparably damaged, a process known as Cavitations.
- Therapeutically, this reaction is useful for its sclerolytic effects.

(4) Acoustic Streaming:

It is a unidirectional movement in the tissues produced by pulsed ultrasound.

CAVITATION

- When ultrasound is applied on the body after 30 to 60 seconds, small bubbles are formed inside the tissue due to the vibration. This phenomenon is called Cavitation.
- These bubbles are about one micro in diameter.

Two Types of CAVITATION

1. Stable
2. Transient

Stable Cavitation:

It is of therapeutic when the cavitation occurs and the bubbles formed oscillate forward and backward but they are still intact to each other , it is called Stable cavitation.

Transient Cavitation

When the condition results in the formation of bubbles of increasing diameter, which after few seconds implode and damage cavitation generally occurs at high intensity.

INDICATIONS

Most acute or chronic musculoskeletal conditions such as

- Myositis
- Fibrositis
- Capsulitis
- Bursitis
- Tendinitis

- Tenosynovitis
- Sprains & strains

(2) Myofascial trigger points

(3)Muscle Spasms

(4)Carpal tunnel syndrome

(5)Neuralgia

(6) Neuromas

CONTRA INDICATIONS

1. Infection
2. Pheripheral vascular disorder, such as thrombophelibitis
3. Peripheral neuropathies
4. Malignancies tumor
5. In activity haemorrhaged confusion
6. Recent grafts
7. Over metal Implants
8. Fertile epiphysis of children
9. Directly at the abdomen of pregnant ladies, as it may lead to deafness of fetus.
10. Near pacemaker
11. Reproductive organs or abdominal organs
12. On fracture site
13. Tuberculosis of bone.
14. Over eyes, ear & throat.

PARAFFIN WAX THERAPY

Introduction

Paraffin wax therapy is one of the most convenient, reasonably efficient methods of applying conducted heat to the extremities. Paraffin wax of low melting point (55^0C) is used. In order to keep the wax liquid at lower temperature, and to prevent burns, liquid paraffin mineral oil is added to the melted wax. The paraffin wax then remains melted at a temperature of 40^0 C to 44^0 C.

Physiological Effects of Paraffin Wax

Heat Production

- There is a marked increase in skin temperature in the first two minutes up to 12 – 13 ^{0} C.
- This drop, while in the wax wrapping, about 8^0C
- In the subcutaneous fascia, there is an increase of 5^0C at the end of the treatment
- In superficial muscles there is only about 2^0 C – 3^0 C rises in temperature at the end of treatment.

Circulatory Effects

- Stimulation of superficial capillaries and arterioles cause local hyperemia and reflex vasodilatation.

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- The effects of vasodilatation in the muscles are negligible but there may be some reflex heating in the joints.
- Exercise after wax is essential to increase muscle circulation.

Analgesic Effects

The most important effect of wax is its marked sedative effect on the tissue. The moist heat is remarkably soothing to the patient.

Stretching Effects

Wax leaves the skin moist, soft and pliable. This is useful for stretching scars & adhesions before applying mobilization techniques.

INDICATIONS

1. Pain and muscles spasm
2. Oedema and Inflammation
3. Rheumatoid arthritis
4. Adhesions and scars

CONTRA INDICATIONS

1) Impaired skin sensation
2) Some Dermatological condition
3) Circulatory dysfunction
4) Analgesic drugs
5) Infections and open wound
6) Cancer and tuberculosis
7) Gross Oedema
8) Lack of comprehension
9) Deep X-ray therapy
10) Open structure

Methods of Application

1) **Dip Method**The therapist instructs the patient to dip the body part in the bath and then remove it until the paraffin solidifies and then a thin layer of adherent solid paraffin is formed which covers the skin.

- Dipping is repeated until a thick wat is formed.

2) **Immersion Method**

The body part to be treated is dipped 3 to 4 times to form a thin coat and then left immersed in paraffin for 20 – 30 minutes.

3) **Brush Method**

- In this method 8 to 10 coats of wax are applied to the area with a paint brush using even and rapid strokes.
- The area is wrapped with towels for 10 to 20 minutes, and after this time paraffin wax is removed and discarded.

4) **Bandage Method**

In this method bandage of a suitable size and mesh is soaked in hot wax and then it is wrapped around the limb.

INFRARED RADIATION

INTRODUCTION

- Infrared rays have been used for various therapeutic effects.
- Infrared rays lie between visible light and microwave on the spectrum.
- They have wavelength in the range of 750 – 400000 nanometers.
- Infrared radiations are produced by various kinds of molecular vibration.

Dangers with Infrared Treatments

Burns:-

- The most obvious danger is of a heat burn
- Burn can of course, arise if the infrared lamp sets fire to some combustible material.
- The patients could be burnt if he or she falls asleep during the treatment.

Skin Irritation:-

- Most acute inflammatory skin conditions are made worse by heating.

Lowered Blood Pressure:-

- Extensive irradiation is accompanied by a fall in blood pressure which may result in faintness (postural hypotension) due to hypoxia of the brain.
- Especially on standing up, immediately after treatment.

Areas of Defective Arterial Blood Flow:-

- Area affected by arterial disease such as atherosclerosis, arterial injury or after skin grafting should not be treated as it could result in tissue necrosis.

Eye Damage:-

- Prolonged and extensive exposure to infrared can cause corneal burns.

Dehydration:-

- Prolonged and intensive treatment to large body areas could cause sweating, sufficient to provoke dehydration if the water is not replaced.

Physiological Effects of IRR

- Infrared treatment produces heating effects in the superficial epidermis, resulting is vasodilation which increase blood circulation in that area.
- This will lead to more oxygen supply and nutrient supply in that area leading to drainage of waste products, resulting in the relief of pain.

Therapeutic Effects:-

- Infrared radiation produces healing effects on the superficial epidermis**.**
- This result is the increase in blood circulation as superficial wounds require good blood supply for healing.

Neurological Effects:-

- Infrared radiations are used for muscle relaxation this helping in the treatment of inflammation.
- Infrared radiation due to sedative effects on the nerve endings help in relieving path muscle spasm and neuralgia.

INDICATIONS:-

IRR is used for the following purpose:-

- To reduce pain
- To reduce muscular spasm
- To reduce joints stiffness
- To accelerate the healing process
- To improve the local circulation
- To reduce edema
- To promote sweating

- To increase the elasticity of connective tissue.

CONTRA-INDICATIONS

- Impaired sensation
- Impaired circulation
- Dermatological condition
- Metal (there should be no metal)
- Analgesic and Narcotic drugs
- Skin tumors
- Acute infarction
- Severe cardiac conditions

INTERFERENTIAL CURRENT

- When Two medium frequency currents of different frequencies (4000hz & 4100hz), cross each other, they produce a third current known as interferential current.

- **BEAT FREQUENCY-** frequency of the third current is known as beat frequency. It lies between 0-100 hz

THERAPEUTIC EFFECTS

- Pain relief
- Relief of muscle spasm
- Stimulation of innervated muscles • Decreases swelling
- Increased blood circulation.

ELECTRODES

- Pad electrodes
- Vacuum electrodes

DOSAGE- Time duration-10-20 minutes. If more than one area is to be treated, then treatment time should not exceed 30 minutes.

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INDICATIONS

- Osteoarthritis
- Low back ache
- Frozen shoulder
- Sciatica
- Phantom pain
- Myalgia
- Edema
- Bursitis/tendinitis

CONTRAINDICATIONS

- Cardiac pacemaker
- Hypertension
- Hypotension
- Thrombosis
- Hemorrhage
- Pregnancy
- Cancer
- TB

PRECAUTION

- IFT machine should be kept atleast 6m away from SWD otherwise it could cause circuit damage.

ADVANTAGES- Metal is not contraindicated.

HYDROCOLLATOR UNIT

- The hydro-collator unit is **a stainless steel tank** in which **silica gel packs** are heated.

- The heater is **thermostatically controlled** and maintains water in the unit at a temperature between **76°C and 80°C**.

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- It can be **left on continuously as long** as there is enough water in the tank.

Hydrocollator Pack/ Hot Pack

- A hydro collator pack is a fabric envelope containing *silica gel*.
- The main property of the gel is to absorb heat from the water, to give moist heat for 15 to 30 minutes.
- Packs come in various sizes and shapes The packs last about six months.
- The packs are wrapped in towel before placing over patient's body.

Indications for Hydrocollator Packs

1. Pain and muscle spasm.
2. Inflammation.
3. Oedema.
4. Adhesions.

Contra-indications for Hydrocollator Packs:

1. Impaired Skin Sensation
2. Circulatory dysfunction
3. Infections and open wounds
4. Cancer and Tuberculosis
5. Gross Oedema
6. Following X-Ray Therapy

SHORTWAVE DIATHERMY

- High frequency currents are used
- Frequency-27.12 MHz Wavelength-11 Meters Generates Electromagnetic Field

PHYSIOLOGIC EFFECTS

- Tissue Temperature Increase Increased Blood Flow (Vasodilation)
- Increased Metabolism
- Muscle Relaxation Analgesia
- Reduces excitability of nerves Sweating

THERAPEUTIC EFFECTS

- Pain relief
- Reduces muscle spasm
- Reduces joint stiffness
- Reduces chronic inflammation
- Accelerates healing

INDICATIONS

- Low back ache
- Osteoarthritis
- Rheumatoid arthritis
- Sprain
- Strain
- Frozen shoulder
- Myalgia
- Ankylosing spondylitis
- Capsulitis
- Tendinitis
- Bursitis

CONTRAINDICATIONS

1. F e v e r
2. P r e g n a n c y
3. Cardiac pacemaker
4. Hemorrhage

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5. Thrombosis
6. Metal Implantation

- Metal implants
- Impaired sensations
- Malignancy
- Following x-ray therapy
- Mentally retarded patients

Transcutaneous Electrical Nerve Stimulation (TENS)

Types of TENS:-

1) High Frequency TENS: - Frequency is above 50 Hz. It is used for acute pain.
2) Low frequency TENS: - Frequency is below 50 Hz. It is used for chronic pain.
3) Acupuncture TENS: - Frequency is 0.4-4 Hz.
4) Burst TENS: - Frequency is 1-10 Hz.

How does TENS work:- A TENS unit provides electrical stimulation to the painful area using electrodes attached to the skin

Electrical signals

Nerve sensation stops

Natural pain relieving substances

No pain message to brain

No pain

Indications:-

- Acute pain
- Joint pain –RA, OA
- Muscle spasm
- Myalgia
- Radiating pain
- Phantom pain
- Labor pain

Contraindications:-

- Cardiac pacemaker
- Recent bleeding
- Anterior aspect of neck
- Patient allergic to gel

Dosage:-

- Acute pain – 20 minutes
- Chronic pain – 30 minutes

ULTRAVOILET RADIATION

Introduction

- UVR are **INVISIBLE** to the human eyes. • Natural source of UVR is **SUN**.

Types of UVR-

- 1. UVA – 400 – 315nm. Penetrates the skin causing tanning.
- 2. UVB – 315 – 280nm. Causes sunburn, Vitamin D synthesis. Responsible for inducing skin cancer.
- 3. UVC – 280 – 100nm {Does not reach the surface of the earth

UVR Generators

- 1. High pressure mercury vapour lamp – Air cooled.
- 2. High pressure mercury vapour lamp – Water cooled (Kromayer lamp).
- 3. Fluorescent lamp

Local effects of UVR

- 1. ERYTHEMA – It is reddening of the skin.
- 2. Pigmentation / tanning
- 3. Desquamation / peeling-It is the CASTING OFF of dead cells from the surface of the skin.
- 4. Antibiotic effect- UV causes the destruction of viruses, bacteria, fungi commonly found in wounds.
- 5. Vitamin D Production

INDICATIONS of UVR

- 1. PSORIASIS
- 2. ACNE
- 3. EZEMA
- 4. CHRONIC INFECTION & INFECTED WOUNDS

- 5.ULCER

Contraindication of UVR

- 1. Pulmonary Tuberculosis
- 2. Severe cardiac disturbances
- 3. Severe Diabetes
- 4. Known Photosensitivity
- 5.Following X–Ray therapy
- 6.Photoallergy

Dangers

- 1. **Shock**
- 2. **Eyes** - UVR may produce conjunctivitis, iritis or cataract.
- 3. **Over Dosage** – UVR burn can occur.

Test dose

MINIMAL ERYTHEMAL DOSE

- It is a slight reddening (erythema) of the skin. This is E1 dose.
- From this all other doses of UVR can be calculated.

E2= 2½ x E1 • E3 = 5 x E1

- E4 = 10 x E1

CALCULATION OF DOSAGE

- **EXAMPLE:**
- If the E1 dose of the patient is 25sec, calculate the E3 dose?
- E1 dose = 25sec
- E3 dose = 5 x E1

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Description of Erythema

Degree of Erythema	Latent period In HRS	Appearance color	Duration of Erythema	Skin Oedema	Skin discomfort	Desquamation of skin	Relation to E1 Dose
E1	6-8	Mildly pink	<24hrs	None	None	None	E1
E2	4-6	Definite Pink Red. Blanches on Pressure	2 Days	None	Slight Soreness, Irritation	Powdery	2.5% of E1
E3	2-4	Very red, Does not blanch on pressure	3-5 Days	Some	Hot & Painful	In thin Sheets	5 % of E1
E4	<2	Angry Red	A Week	Blister	Very Painful	Thick Sheets	10% of E1

WALKING AIDS

WALKERS

These are used as assistance device for walking.

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