ELECTRIC CURRENT IN TREATMENT & MEDICAL APPLICATIONS

5. IMPORTANCE OF CURRENT IN TREATMENT

Electrical current is a **therapeutic tool** used in physiotherapy, rehabilitation, and pain management. It supports both **recovery and function restoration**.

5.1 Stimulates Healing

Mechanism:

Promotes **cellular activity** and **ATP production**.

Enhances **fibroblast migration**, **collagen synthesis**, and **tissue regeneration**.

Applications:

Wound healing.

Pressure sores.

Surgical incisions.

5.2 Reduces Muscle Atrophy

Mechanism:

Electrical stimulation causes **muscle contractions**, preventing disuse atrophy.

Applications:

Immobilized patients.

After orthopedic surgery.

During extended bed rest.

5.3 Pain Management

Mechanism:

Blocks pain signal transmission via **Gate Control Theory**.

Stimulates endorphin release.

Devices Used:

TENS (Transcutaneous Electrical Nerve Stimulation).

Benefits:

Reduced reliance on pain medications.

Non-invasive and low risk.

5.4 Improves Circulation

Mechanism:

Muscle contractions stimulate **blood and lymphatic flow**.

Applications:

Reducing edema.

Enhancing oxygen and nutrient supply to tissues.

5.5 Enhances Drug Delivery

Method: **Iontophoresis**

Mechanism:

Uses **direct current (DC)** to deliver **ionized medications** through the skin.

No injections or oral intake needed.

Common Drugs:

Dexamethasone (anti-inflammatory).

Lidocaine (anesthetic).

5.6 Promotes Functional Recovery

Mechanism:

Stimulates **paralyzed or weak muscles** to contract.

Supports **neuromuscular re-education**.

Applications:

Post-stroke motor recovery.

Spinal cord injury.

Cerebral palsy.

Techniques:

Functional Electrical Stimulation (FES)

Neuromuscular Electrical Stimulation (NMES)

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6. USES OF ELECTRICITY IN THE MEDICAL FIELD

Electricity is used in **diagnosis, therapy, surgery, and rehabilitation** across multiple healthcare disciplines.

6.1 Diagnostic Applications

Electrical signals help diagnose disorders of muscles, nerves, and the heart.

1. Electromyography (EMG)

Purpose: Measures the **electrical activity of muscles**.

Used to Diagnose:

Neuromuscular diseases.

Muscle disorders.

Nerve dysfunction.

2. Electrocardiogram (ECG/EKG)

Purpose: Records **electrical activity of the heart**.

Used to Detect:

Arrhythmias.

Myocardial infarction.

Heart block and ischemia.

6.2 Therapeutic Applications

Electrical stimulation is applied for **pain control, muscle stimulation, and healing**.

3. TENS (Transcutaneous Electrical Nerve Stimulation)

Application: Pain relief.

Mechanism: Stimulates sensory nerves to block pain pathways.

4. NMES / FES (Neuromuscular / Functional Electrical Stimulation)

Application: Muscle strengthening and motor recovery.

Used in: Stroke rehabilitation, muscle re-education.

5. Interferential Therapy (IFT)

Application: **Deep tissue pain relief**.

Mechanism: Uses **two medium-frequency currents** that intersect to produce a low-frequency therapeutic current.

6. High Voltage Pulsed Current (HVPC)

Application: **Wound healing and edema reduction**.

Mechanism: Delivers short, high-voltage pulses that stimulate tissue repair.

7. Microcurrent Therapy

Application: **Cellular repair and pain management**.

Mechanism: Uses ultra-low currents that mimic natural bioelectric signals.

6.3 Surgical Applications
Electricity is used to **cut, cauterize, or vaporize tissues** during surgical procedures.
8. Electrocautery / Electrosurgery

Function: Uses **high-frequency electrical current** to:

Cut tissue precisely.

Coagulate blood vessels.

Applications:

Tumor removal.

Skin lesion excision.

9. Laser Surgery

Mechanism: Light energy (often powered electrically) is used to:

Cut or vaporize tissue.

Seal blood vessels.

Applications:

Eye surgeries (e.g., LASIK).

Cancer treatments.

Dermatological procedures.

6.4 Rehabilitation
Electrical modalities are integral in **post-injury and post-operative rehabilitation**.

Used For:

Muscle strengthening.

Joint mobility restoration.

Neuromuscular re-education.

Common Modalities:

NMES, FES.

TENS (for pain management).

Iontophoresis (for inflammation).

Goals:

Restore **function and independence**.

Prevent complications like contractures or pressure sores.

SUMMARY TABLE: USES OF ELECTRICITY IN MEDICINE

Application	Purpose	Example Modalities
Diagnostic	Evaluate muscle/nerve/heart activity	EMG, ECG
Therapeutic	Treat pain, stimulate healing/muscles	TENS, NMES, HVPC, IFT, Microcurrent
Surgical	Cut, coagulate, or vaporize tissue	Electrocautery, Laser surgery
Rehabilitation	Restore movement and function	NMES, FES, TENS, Iontophoresis

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CONCLUSION

Electric current plays a vital role in modern medicine.

It supports **diagnosis, therapy, surgery, and rehabilitation**.

Proper understanding of current types, mechanisms, and applications ensures **safe and effective treatment** outcomes.

Clinicians must also ensure **safety protocols**, appropriate **patient selection**, and correct **device operation**.