INTERRUPTED DIRECT CURRENT (IDC)

1. Definition, Type, Duration, Shape, Frequency

1.1 Definition

Interrupted Direct Current (IDC), also known as **Galvanic Interrupted Current (IGC)**, is a **monophasic direct current** that is **periodically switched on and off**.

Unlike continuous DC which flows steadily, IDC flows in **pulses of direct current**, separated by intervals of no current.

This interruption reduces skin irritation and chemical effects compared to continuous galvanic current.

1.2 Type

IDC is a **monophasic pulsed current**.

It is also referred to as:

Interrupted Galvanic Current (IGC)

Interrupted Direct Current

1.3 Duration

Pulse Duration (ON time): Usually ranges from **0.5 to 10 seconds**, adjustable based on treatment needs.

Interruption Time (OFF time): Equal or longer than ON time to enhance patient comfort.

Total Treatment Time: Typically between **10 to 30 minutes**, depending on the clinical condition.

1.4 Shape

Pulses are **rectangular or square waveforms** of direct current.

During ON time, current amplitude is **steady**.

During OFF time, the current is **zero** (no flow).

1.5 Frequency

Frequency is determined by the rate at which the current is interrupted, i.e., number of pulses per second.

Typically **low frequency**, ranging from **0.5 to 2 Hz**, due to longer pulse durations.

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2. Production of Interrupted Direct Current

Produced by galvanic current devices equipped with **mechanical or electronic interrupters**.

The interrupter breaks the current flow periodically, converting continuous DC into **pulsed DC**.

Modern devices utilize **electronic switching circuits** for precise control of:

Pulse duration (ON time)

Pulse frequency (interruption rate)

The interrupted flow helps reduce:

Skin irritation

Chemical burns

Electrochemical changes compared to continuous galvanic current.

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3. Physiological Effects & Therapeutic Effects of Interrupted Direct Current

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3.1 Physiological Effects

Electrochemical Effect:

Ion migration caused by current flow (movement of cations and anions).

Results in **chemical changes in tissues** beneficial in treatments like iontophoresis.

Electrothermal Effect:

Minimal heating due to interrupted current, avoiding tissue damage.

Excitation of Nerve and Muscle Fibers:

Stimulates both motor and sensory nerves.

Produces muscle contractions and sensory sensations.

Muscle Contraction:

Produces **stronger and longer-lasting contractions** compared to Faradic current due to longer pulse durations.

Improved Circulation:

Muscle contractions act as a pump improving **local blood flow** and oxygenation.

Pain Relief:

Stimulation of sensory nerves modulates pain signals via the **gate control theory**.

Reduction of Edema:

Enhances lymphatic and venous drainage, reducing swelling.

3.2 Therapeutic Effects

Muscle Strengthening and Re-education:

Effective in stimulating weak but innervated muscles.

Reduction of Muscle Spasms:

Sustained contractions can relax muscle spasm.

Stimulation of Denervated Muscles:

Longer pulse durations can stimulate muscles lacking nerve supply.

Pain Management:

Sensory nerve stimulation for acute and chronic pain relief.

Improvement of Blood Flow and Tissue Healing:

Enhanced circulation supports repair processes.

Management of Atrophic Muscles:

Prevents muscle wasting due to disuse or nerve injury.

Correction of Motor Deficits:

Used in treating conditions such as:

Foot drop

Other peripheral motor deficits