JHARKHAND RAI UNIVERSITY

RANCHI

LAB MANUAL

PRINCIPLES OF BIOELECTRICAL MODALITIES - I

BPT III

CONTENT

PRACTICAL-1

AIM:

To study and understand the proforma used for the patient assessment in order to evacuate its components and application in clinical practice.

PROFORMA FOR PATIENT'S ASSESSMENT:

1. **Receiving the patient-** Good morning, I am a physiotherapist and I am going to treat you. Please, cooperate with me during the treatment and wait until I go through your case sheet.
2. **History Taking or going through the case sheet-**
   i. Name
   ii. Father's and mother's name
   iii. Age
   iv. Sex
   v. Occupation
   vi. Address- Correspondence and permanent

3. **Chief complaints-**
   i. History of present illness
   ii. History of past illness
   iii. Family history
   iv. Social and occupational history
   v. Treatment history
   vi. Prognosis of the treatment
   vii. Investigation:
      - Hematological tests
      - Radiological tests: X-rays, MRI scan, etc.
      - Others

4. **Checking for general contraindications-**
   i. Hyperpyrexia/fever
   ii. Hypertension
   iii. Anemia
   iv. Severe renal and cardiac failure
   v. Deep X-ray and cobalt therapy
   vi. Epileptic patient
   vii. Noncooperative patients
   viii. Mentally retarded patient
   ix. Very poor general condition of the patient, etc.

5. **Checking for local contraindications:**
   i. Open wounds
   ii. Very recent fractures
   iii. Skin grafts
   iv. Severe edema
   v. Hairy surface
   vi. Acute inflammation
   vii. Metal in the part
   viii. Malignant growth
   ix. Hypersensitive skin
   x. Loss of sensation, etc.

6. **Preparation of trays:**
   i. Skin resistance lowering tray-
      - Saline water
      - Soap
      - Cotton
      - Vaseline
      - Towels. Etc.

   ii. Treatment trays-
      - Mackintosh
      - Lint pads
      - Pad or plate electrodes and pen electrode
      - Leads
      - Straps
      - Cotton
      - Powder
      - Gel, etc.

7. **Preparation of treatment tray-**
   a. **Mackintosh:** the mackintosh is to be kept under the patient's treatment part to prevent earth shock and to prevent dripping of water.
   b. Lint pad: the lint pad is made up of lint cloth and it is used to prevent accumulation of chemicals in the tissues formed during the treatment which if not prevented leads to burn. It must be in 8 or 16 layers. More the layers of lint pad, less the chance of accumulation of the chemicals, less the chance of burn.
   c. To stimulate more numbers of motor points, two different electrodes covered with lint pads are used. If stimulation of individuals muscle is required, pen electrode is used (Active). Always to use indifferent pad proximally (nerve trunk or plexus) and active pad distally (individual muscle).
   d. Active pad- it is the place where the electrons enter the circuit. It is smaller than the indifferent pad always. It should be placed on the motor point distally (pen electrode).

e. **Indifferent pad-** it is the place where electrons leave the circuit. It is placed proximally. This helps to complete the circuit.
f. **Electrodes-** electrodes could be of pad or plate type or pen type. Pad or plate electrodes are kept in between the lint pads for even distribution of current. The edges of plate electrode should be blunt.
g. **Leads-** used to connect the electrodes with the stimulator.
h. Straps- use rubber straps usually. It should be placed over the pad.
i. **Cotton-** used to prevent dripping of water and cleaning the surface.
j. **Powder-** used to apply over the skin if there are any redness after the treatment. It gives soothing effect.
k. Gel- used for pad electrodes where lint pads are not used. Gel is used for proper contact of electrodes with the patient's surface.

8. Preparation of skin resistance lowering tray:

a. **Saline water:** prepared by adding the pinch of salt to the bowl of water. The aim of preparing saline water is to prepare more ions so that minimum amount of current that is enough to get the brisk contraction.
b. **Soap:** it is used for cleansing the part to be treated to remove dirt, dust or sebum, etc.
c. **Cotton**: it is used for cleaning the surface.
d. **Vaseline:** it is applied over scar tissue. It prevents the concentration of more current on scar tissue.
e. **Towels:** towels are used for covering the body part. Neat and clean towels should be used every time.

9. Preparation of apparatus:

i. Check whether all the knobs are at zero.
ii. Checking the pins of the plug and checking whether the switch is turned off.
iii. Check the insulation of the wire.
iv. Check whether fuse is present in the apparatus; see that it isn't blown out.
v. Check whether hand switch for patients' use is intact and is working.

10. Correct positioning of the patient:

i. Position the patient in such a way that it is comfortable to the patient.
ii. Part to be treated must be adequate distance from the modality.

11. Correct positioning of the physiotherapist:

i. Position of physiotherapist should also be comfortable so that he/she may not be tired after the treatment.
ii. Position should be such that it provides maximum accessibility to the treatment part and modality.

12. Checking of apparatus: self-test to be done:

i. Apparatus must be checked once in front of patient.
ii. Switch 'on' the apparatus and gradually increase the current.
iii. Explain the patient feel of the current.

13. Correct placing of pads and electrodes

14. **Instructions to the patient:**
    i. I am going to start the treatment. Be relaxed.
    ii. Do not touch anything around you.
    iii. Do not pull the leads.
    iv. Do not touch the walls or the ground**.**

15. **Regulating the current:**
    i. Gradually increase the current
    ii. Keep talking with the patient about the feel of current.
    iii. Tell him to inform you immediately about any inconvenience, discomfort, or burning.
16. **Palpating tendons:** feel the contraction by palpating the tendon.

17. **Selection of current:**
    i. Faradic current
    ii. Galvanic current
    iii. Others

18. **Selection of pulse, frequency, duration and time**

19. **Treatment**

20. **Explanation to the patient:**
    i. Explain the patient advantages of the treatment
    ii. Explain the patient course or duration of treatment
    iii. Explain the patient the do's and don'ts in the home and otherwise.

PRACTICAL-2

AIM:

To identify and study the localization and functions of the motor points in the human body for clinical and therapeutic applications.

MOTOR POINTS:

A motor point is a specific skin area where targeted muscle is best stimulated with the smallest amount of current amplitude and shortest pulse duration.

A. Motor points of the anterior aspect of arm:

Sl. No.	Muscles	Actions
1.	Pectoralis major	Flexion, abduction, internal rotation of shoulder
2.	Deltoid anterior fiber	Flexion of shoulder
3.	Deltoid middle fiber	Abduction of shoulder
4.	Coracobrachialis	Flexes and abducts arm
5.	Biceps brachii	Elbow flexion
6.	Brachialis	Flexes elbow at prone
7.	Brachioradialis	Flexes elbow at mid-prone
8.	Flexor carpi ulnaris	Flexes and adduct wrist
9.	Flexor carpi radialis	Flexes and abduct wrist
10.	Palmaris longer	Flexes the wrist
11.	Flexor digiti profundus	Flexes distal phalanges
12.	Flexor pollicis longus	Flexion of thumb
13.	Pronator teres	Pronation of forearm
14.	Flexor digiti superficialis	Flexion (index, middle, ring) PIP
15.	Abductor digiti minimi	Abducts little finger in hand
16.	Abductor pollicis longus	Abducts the thumb at carpometacarpal joint
17.	Opponens pollicis	Medially rotate thumb
18.	Flexor and Opponens	Flex
19.	lumbricals	Flex MCP and extend interpersonal joints
20.	Flexor pollicis brevis	Flexes the thumb

B. Motor points of the posterior aspect of arm:

Sl. No.	Muscles	Actions
1.	Deltoid posterior fibers	Extension of shoulder
2.	Triceps a. Long head b. Lateral head c. Medial head	Extension of elbow
3.	Supinator	Supination of forearm
4.	Extensor carpi radialis longus/brevis	Extension of wrist, radial deviation
5.	Extensor carpi ulnaris	Wrist extension, wrist adduction, ulnar deviation
6.	Extensor digitorum	Extensor of finger
7.	Extensor digiti-minimi	Extension of little finger
8.	Abductor pollicis longus and extensor pollicis brevis	Abducts and extend the thumb
9.	Extensor pollicis longus	Extend the thumb
10.	Adductor pollicis	Adduction of thumb
11.	interossei	Flexion of MCP

C. Motor points of the anterior aspect of leg:

Sl. No.	Muscles	Actions
1.	Tensor fascia latae	Hip abduction, rotation, flexion of hip
2.	Sartorius	Flexion of knee, and hip
3.	Rectus femoris	Hip flexion and knee extension
4.	Vastus lateralis	Knee extension
5.	Vastus medialis	Knee extension
6.	Peroneus brevis	Eversion, plantarflexion
7.	Peroneus longus	Eversion, plantarflexion
8.	Tibialis anterior	Dorsiflexion, inversion
9.	Extensor digitorum longus	Toe extension, dorsiflexion
10.	Extensor halllucis longus	Dorsiflexion of ankle
11.	Extensor digiti brevis	Toe extension

D. Motor points of the posterior aspect of leg:

Sl. No.	Muscles	Actions
1.	Gluteus medius	Hip adduction and rotation
2.	Gluteus maximus	Hip extension, lateral rotation
3.	Biceps femoris	Knee flexion, lateral rotation
4.	Semimembranosus	Knee flexion, hip extension, internal rotation
5.	Semitendinosus	Hip extension, knee flexion
6.	Gastrocnemius	Plantarflexion of ankle
7.	Soleus	Ankle platar flexion
8.	Flexor digitorum longus	2^{nd}, 3^{rd}, 4^{th}, and 5^{th} toe flexion
9.	Flexor hallucis longus	Great toe flexion
10.	Tibialis posterior	Plantar flexion, inversion

E. Motor points of the muscles supplied by the facial nerve

Sl. No.	Muscles	Actions
1.	Frontalis	Raises eyebrows and wrinkling of forehead
2.	Corrugator	Move eyebrow inward down
3.	Orbicularis Oris	Pouting, facial expression
4.	Orbicularis oculi	Closing eyelids
5.	Levator labii superioris	Raises upper lip
6.	Levator labii Oris	Raises corner of mouth
7.	Risorius	Facial expression
8.	Depressor anguli Oris	Depress corner of mouth
9.	Mentalis	Elevates chin and helps in elevating lower lip while pouting
10.	Buccinator	Blowing, smiling, chewing

F. Motor points of the backs:

Sl. No.	Muscles	Actions
1.	Supraspinatus	Abduction of arm
2.	Trapezius- upper fibers	Scapula elevation
3.	Trapezius- middle fibers	Retract scapula
4.	Trapezius- lower fibers	Depression of scapula
5.	Infraspinatus	External rotation of arm
6.	Teres major and minor	Adduction, internal rotation and external rotation
7.	Rhomboids	Scapular retraction, elevation and rotation
8.	Serratus anterior	Rib elevation, scapular rotation
9.	Latissimus dorsi	Shoulder extension, adduction, trunk rotation

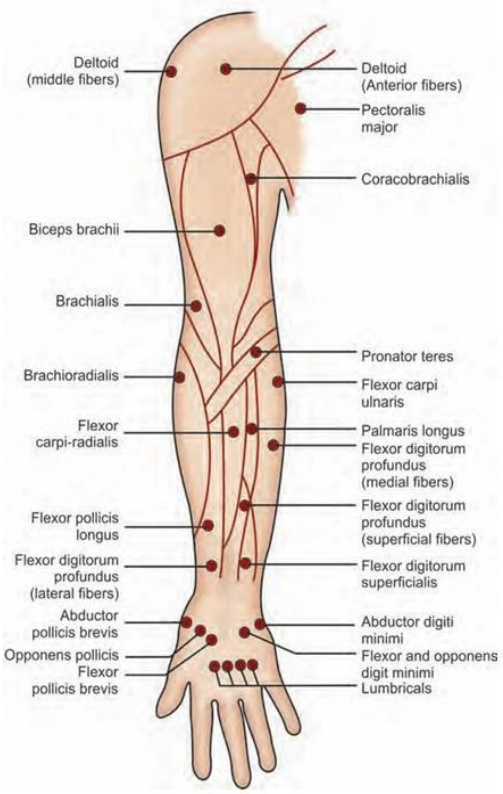

Fig. 2.23: Motor points of the anterior aspect of the right arm

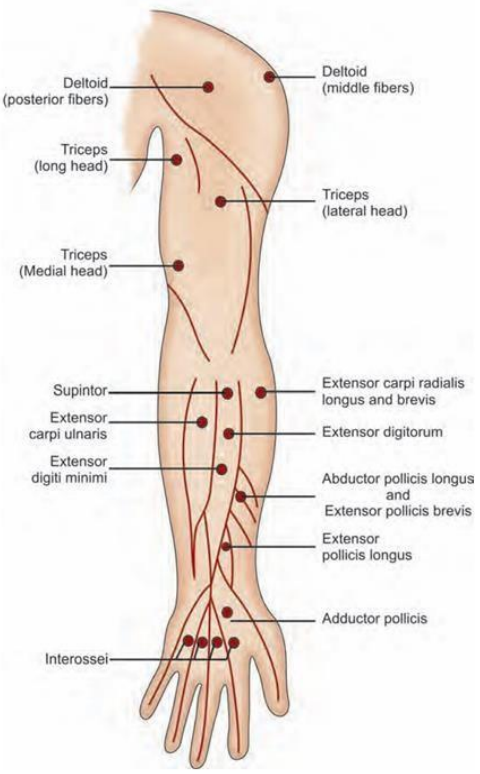

Fig. 2.24: Motor points of the posterior aspect of the right arm

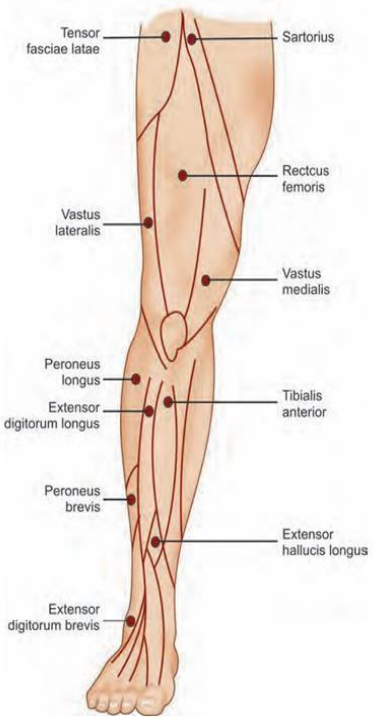

Fig. 2.25: Motor points of the anterior aspect of the right leg

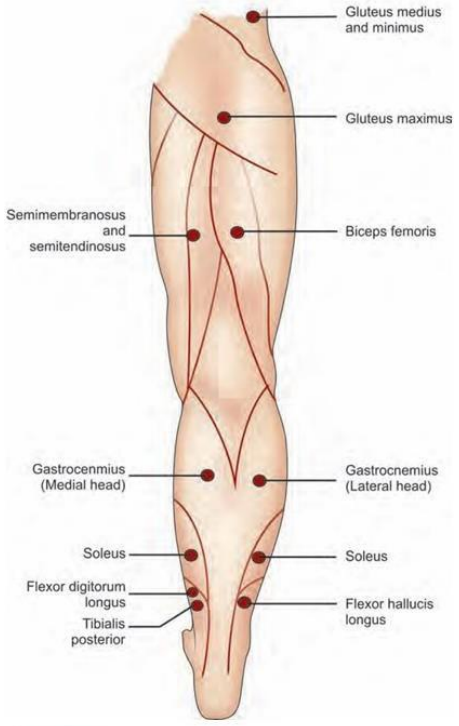

Fig. 2.26: Motor points of the posterior aspect of the right

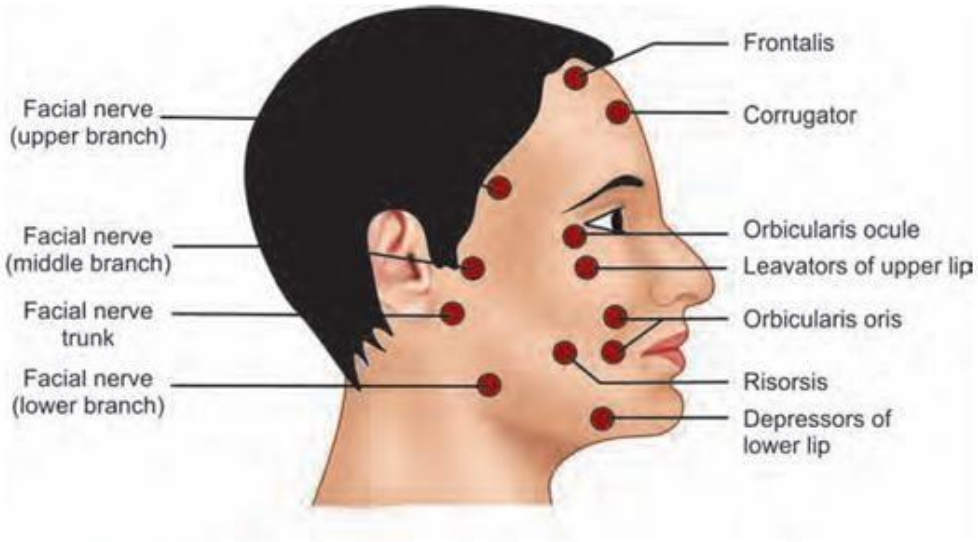

Fig. 2.27: Motor points of the muscles supplied by the facial nerve

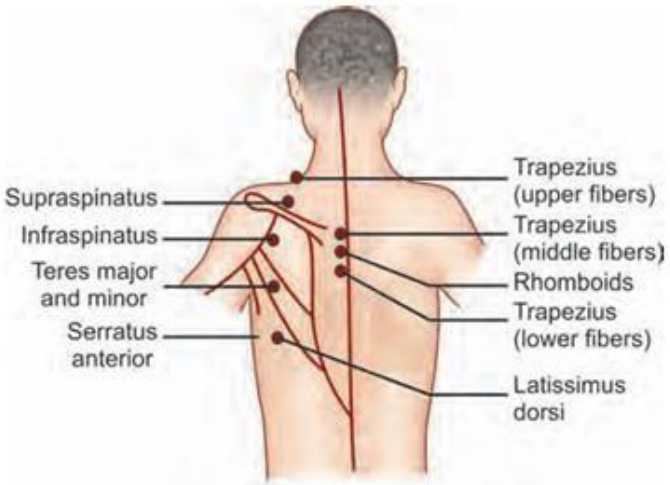

Fig. 2.28: Motor points of the back

PRACTICAL-3

AIM:

To explore the mechanisms of the pain gate theory and understand its impact on the pain perception.

DEFINATION OF PAIN:

- Pain is defined as an unpleasant and emotional experience associated with or without actual tissue damage.
- Pain sensation is described in many ways like sharp, pricking, electrical, dull ache, shooting, cutting, stabbing, etc.
- Pain is produced by real or potential injury to the body. Often it is expressed in terms of injury. For example, pain produced by fire is expressed as burning sensation; pain produced by severe sustained contraction of skeletal muscles is expressed as cramps.
- Pain may be acute or chronic.
- **Acute pain** is a sharp pain of short duration with easily identified cause. Often it is localized in a small area before spreading to neighbouring areas. Usually, it is treated by medications.
- **Chronic pain** is the intermittent or constant pain with different intensities. It lasts for longer periods. It is somewhat difficult to treat chronic pain and it needs professional expert care.

COMPONENTS OF PAIN SENSATION

Pain sensation has two components:

1. Fast pain
2. Slow pain.

- Fast pain is the first sensation whenever a pain stimulus is applied. It is experienced as a bright, sharp and localized pain sensation.
- Fast pain is followed by the slow pain, which is experienced as a dull, diffused and unpleasant pain.
- Receptors for both the components of pain are same, i.e. the free nerve endings. But afferent nerve fibres are different. Fast pain sensation is carried by Aδ fibers and slow pain sensation is carried by C type of nerve fibers.

PAIN PATHWAYS

Pain sensation from various parts of body is carried to brain by different pathways which are:

1. Pathway from skin and deeper structures
2. Pathway from face
3. Pathway from viscera
4. Pathway from pelvic region.

1. FROM SKIN AND DEEPER STRUCTURES

- **Receptors**:
  - Receptors of pain sensation are the free nerve endings, which are distributed throughout the body.
- **First Order Neurons**
  - First order neurons are the cells in posterior nerve root ganglia, which receive the impulses of pain sensation from pain receptors through their dendrites. These impulses are transmitted to spinal cord through the axons of these neurons.
  - **Fast pain fibers**: Fast pain sensation is carried by Aδ type afferent fibers which synapse with neurons of marginal nucleus in the posterior gray horn.
  - **Slow pain fibers**: Slow pain sensation is carried by C type afferent fibers, which synapse with neurons of substantia gelatinosa of Rolando in the posterior gray horn (Fig. 143.4).
- **Second Order Neurons**
  - Neurons of marginal nucleus and substantia gelatinosa of Rolando form the second order neurons. Fibers from these neurons ascend in the form of the lateral spinothalamic tract.
  - **Fast pain fibers:** Fibres of fast pain arise from neurons of marginal nucleus. Immediately after taking origin, the fibers cross the midline via anterior gray commissure, reach the lateral white column of the opposite side and ascend. These fibers form the neospinothalamic fibers in lateral spinothalamic tract. These nerve fibers terminate in ventral posterolateral nucleus of thalamus. Some of the fibers terminate in ascending reticular activating system of brainstem.
  - **Slow pain fibers**: Fibers of slow pain, which arise from neurons of sub-Stantia gelatinosa, cross the midline and run along the fibers of fast pain as paleo spinothalamic fibers in lateral spinothalamic tract. One fifth of these fibers terminate in ventral posterolateral nucleus of thalamus. Remaining fibers terminate in any of the following areas:
    i. Nuclei of reticular formation in brainstem
    ii. Tectum of midbrain
    iii. Gray matter surrounding aqueduct of Sylvius.
- **Third Order Neurons**
  - Third order neurons of pain pathway are the neurons in:
    i. Thalamic nucleus
    ii. Reticular formation
    iii. Tectum
    iv. Gray matter around aqueduct of Sylvius.
  - Axons from these neurons reach the sensory area of cerebral cortex. Some fibers from reticular formation reach hypothalamus.
- **Center for Pain Sensation**
  - Center for pain sensation is in postcentral gyrus of parietal cortex. Fibers reaching hypothalamus are concerned with arousal mechanism due to pain stimulus

2. **FROM FACE**

- Pain sensation from face is carried by trigeminal nerve.

3. **FROM VISCERA**

- Pain sensation from thoracic and abdominal viscera is transmitted by sympathetic (thoracolumbar) nerves. Pain from oesophagus, trachea and pharynx is carried by vagus and glossopharyngeal nerves.

GATE CONTROL THEORY

- Psychologist Ronald Melzack and the anatomist Patrick Wall proposed the gate control theory for pain in 1965 to explain the pain suppression.
- According to them, the pain stimuli transmitted by afferent pain fibers are blocked by gate mechanism located at the posterior gray horn of spinal cord.
- If the gate is opened, pain is felt. If the gate is closed, pain is suppressed.

Mechanism of Gate Control at Spinal Level

1. When pain stimulus is applied on any part of body, besides pain receptors, the receptors of other sensations such as touch are also stimulated
2. When all these impulses reach the spinal cord through posterior nerve root, the fibers of touch sensation (posterior column fibers) send collaterals to the neurons of pain pathway, i.e. cells of marginal nucleus and substantia gelatinosa
3. Impulses of touch sensation passing through these collaterals inhibit the release of glutamate and substance P from the pain fibers
4. This closes the gate and the pain transmission is blocked.

Role of brain in gate control mechanism

- According to Melzack and Wall, brain also plays some important role in the gate control system of the spinal cord as follows:
  1. If the gates in spinal cord are not closed, pain signals reach thalamus through lateral spinothalamic tract
  2. These signals are processed in thalamus and sent to sensory cortex
  3. Perception of pain occurs in cortical level in context of the person's emotional status and previous experiences
  4. The person responds to the pain based on the integration of all these information in the brain. Thus, the brain determines the severity and extent of pain.
  5. To minimize the severity and extent of pain, brain sends message back to spinal cord to close the gate by releasing pain relievers such as opiate peptides
  6. Now the pain stimulus is blocked and the person feels less pain.

Significance of Gate Control

- Thus, gating of pain at spinal level is similar to pre synaptic inhibition.

- It forms the basis for relief of pain through rubbing, massage techniques, application of ice packs, acupuncture and
  electrical analgesia.
- All these techniques relieve pain by stimulating the re lease of endogenous pain relievers (opioid peptides), which close the gate and block the pain signals.

APPLIED PHYSIOLOGY

1. **Analgesia:** Analgesia means loss of pain sensation.
2. **Hyperalgesia**: Hyperalgesia is defined as the increased sensitivity to pain sensation.
3. **Paralgesia:** Abnormal pain sensation is called paralgesia.

PRACTICAL-04

AIM: - To optimize TENS electrode placement and Dosimetry settings for maximum pain relief and functional improvement in patients with different pain syndrome.

Introduction: - Transcutaneous electrical nerve stimulation (TENS) is a simple, non-invasive analgesic technique, used extensively by physiotherapist to reduce pain of any origin.

- Pulse patterns: continuous/ burst
- Channels: single or double channels.

It's a therapy that uses low- voltage electrical currents delivered through electrodes placed on the skin to relieve pain.

Indication:

It is indicated for various conditions particularly those involving acute and chronic pain. Some common indications are: -

- Osteoarthritis
- Chronic back pain: helps relieve discomfort from conditions like herniated discs, muscle strain, or spinal stenosis.
- Sciatica
- Migraine
- Tension headache
- Post operative pain
- Neuropathic pain

Different pain syndromes in patients are: -

1. **Disease Condition: -**

   The patient presents with acute pain due to tension headache. There are no associated symptoms such as nausea, vomiting.

   - **Dosimetry setting:**

     The effectiveness of TENS depends on carefully adjusting the frequency, intensity, pulse, width, and treatment duration based on the pain condition.

     So, pain is acute so we apply,

     - Type of current-burst
     - Pulse duration- 50 microsecond
     - Pulse frequency- 100hz
     - Burst frequency- 10 hz
     - Treatment- 15 minutes

   - **Electrode Placement: -** placement of electrodes on the trapezius region crossed 4 pole, 2 each over the origin and insertion of bilateral trapezius muscle upper fibres strong tingling felt. The non- invasive nature of TENS encouraged patient compliance.

     - Electrode 1: - Over the upper trapezius muscle bilaterally (approx. 2-3 cm from the midline)
     - Electrode 2: At the base of the skull on both sides of the cervical spine.

2. **Disease Condition: The patient present with Frozen Shoulder (Adhesive capsulitis – chronic stage). Onset and progression of symptoms stiffness, pain.**
   - **Dosimetry Setting:** So, the pain is chronic so we apply,
     - Mode- Burst or low – frequency TENS for Long term pain relief.
     - Pulse duration: -40 microsecond
     - Burst Frequency: - 2hz
     - Treatment Duration: - 15 miutes
   - **Electrode Placement: -** Position electrodes stragically around the shoulder.
     - Cross 4 pole around the shoulder.
     - Anterior shoulder: - Near the deltoid or biceps insertion.
     - Posterior Shoulder: Near the infrastructure or trapezius muscle.
     - Avoid direct placement over bony prominences.

3. **Disease condition: - The patient diagnosis with postherpetic neuralgia.**
   - **Dosimetry Setting:**
     - Mode: - Burst type of current
     - Pulse duration: - 50 Microsecond
     - Pulse frequency: - 100hz
     - Burst frequency: - 10 hz
     - Treatment duration: - 15 min
   - **Electrode placement: -** 4 pole method: 2 over the affected area and 2 above & below the exit nerve root.

4. **Disease condition: - The patient present with acute sciatica with radiating pain distribution of radiating pain along the sciatic nerve pathway (e.g. buttocks, posterior thigh, calf or feet).**
   - **Dosimetry setting: -** so the condition is acute we apply:
     - Mode: High frequency TENS for acute pain relief.
     - Frequency: 80-120vhz
     - Pulse width:50 microseconds
     - Intensity1: comfortable tingling sensation withput muscle contraction.
     - Treatment duration: 20- 30 minute per session
   - **Electrode placement:** Placed cross 4 pole along the sciatic nerve pathway.
     - Place electrode around the lower back (l2-s3 nerve roots)
     - Along the sciatic nerve pathway (gluteal area, posterior thigh, and calf)

5. **Disease condition: The patient present with post- operative pain. Specify the type of surgery (e.g. thoracic surgery, abdominal surgery) and the role of TENS in pain management.**
   - **Dosimetry setting:** The condition is post-operative pain, so we apply
     - Mode continuous mode for acute pain management such as during the early postoperative phase.
     - Pulse duration: - 40 microsecond.
     - Pulse frequency 100 hz
     - Treatment duration: 10-15 minutes per session.

- **Electrode placement:** 4pole method: 2 proximal and 2 distal to operated area. Electrodes should be placed around the pain site, avoiding direct placement over open wounds or incision. For abdominal surgeries, place electrodes around the abdominal area but not directly over the incision.

6. **Disease condition: - Dysmenorrhea (menstrual pain) confirmed by patients' symptoms** (painful cramping). Associated symptoms e.g. nausea, fatigue, bloating.
   - Dosimetry setting: the goal is to provide effective pain relief for dysmenorrhea, so we apply
     - Mode: - High frequency mode for acute pain relief.
     - Frequency: 80-120 hz
     - Pulse width: 50 microseconds
     - Burst frequency: 100hz
     - Treatment duration: 20-30 minutes per session.
   - **Electrode placement:** 2 pole method over the sacrum bilaterally.
     - Position electrodes around the lower abdominal area where cramping is felt.
     - Bilateral placement: place one electrode on each side of the abdomen or along the lower back (sacral area) if back pain is associated.
     - Ensure electrode are placed away from direct contact with uterus.

7. **Disease condition: - The patient present with phantom limb pain following amputation of the right lower limb at the level of the knee, 6month age.**
   - **Dosimetry setting:** Recommended for chronic pain like phantom limb pain, we apply,
     - Mode: - low frequency for chronic pain providing long lasting relief.
     - Frequency: 2-10 hz.
     - Pulse width: 50-150 microseconds
     - Treatment duration: 20-30 minutes per session
   - **Electrodes placement:** place electrodes on or near the residual limb (the area where the limb was amputated. For below knee amputation electrodes can be placed on the upper part of the residual limb (e.g. above the knee).

     2 pole method over above the knee.

PRACTICAL- 05

AIM: - To Analyze patient comfort and safety parameters associated with different electrode placements and dosimetry Settings in Galvanic Current therapy.
Introduction: - Galvanic type current is the long duration, low frequency, interrupted direct current, used for stimulation of denervated muscle. It is a low frequency current with pulse duration over more than 1 millisecond with frequency of 50-100hz.

Contraction of dennervated muscle occurs through sluggish contractions,
stimulations of sensory nerves resulting in pain sensations, and stimulation of motor nerves at higher intensities.

Indications of Galvanic current:

- Facilitation of muscle contraction inhibited by pain.
- Muscle re- education.
- Training a new muscle action.
- During nerve damage.
- Improve venous lymphatic drainage.
- Acute and Chronic pain management.
- Tissue Repair.
- Edema.
- Skin disorder.

Different clinical conditions in patients and their safety parameters are: -

1. **Clinical condition: -** The patient present with Bell's Palsy symptoms. There are symptoms of muscle weakness, degree of nerve involvement.
    - **Functional problems:** Loss of facial expressions and symmetry, drooling of saliva, conjunctivitis.
    - **Dosimetry setting:** Interrupted galvanic current, rectangular pulses at 100 ms duration at 1 pulse per second.
        - As the condition improves, the pulse duration can be progressively reduced to 30,10,3,1 ms and rate of repetition can be increased to 3 pulses per second.
    - **Current Type: -** Direct current.
    - **Intensity: -** Low intensity (adjust to patient tolerance, typically 1-5 ms)
    - **Patient positioning: -** Supine on a plinth.
    - **Safety measures: -**
        - Maintain constant communication with the patient to monitor for discomfort or adverse reactions.
        - Avoid high intensity settings to prevent muscle fatigue or skin irritation.
        - Avoid electrode placement over the open wound or inflamed areas.
    - **Electrode placement: -** Use Small- sized electrodes for facial muscles.
        - **Placement areas: -** Active electrode(cathode): place on the, motor point of affected muscles (e.g. near orbicularis Oris, orbicularis oculi, or zygomaticus major)

- **Inactive electrode (anode):** Place on the cervical region (neutral area) to complete the circuit.

2. **Clinical condition: -** the patient present with foot drop patient unable to dorsiflex the foot, difficult walking, or dragging of the foot.
   - **Functional problem: -** Dropped foot compensated with high stepping gait.
   - **Dosimetry setting:** Set to produce mild muscle contraction without discomfort.
   - **Treatment duration: -** 15- 20 minutes per session.
   - **Frequency:** 3-5 times per week, depending on patient tolerance and progress.
   - **Type of technique:** Monopolar technique, passive 5sq cm Carbon rubber plate, active 1 sq. cm disc on pen holder.
   - **Patient position:** supine on a wooden plinth, a roll under the knee to keep the knee in 10-15 degrees in flexion.
   - **Comfort and safety measures: -**
     - Educate the patient about procedure, expected sensations, and sign of discomfort.
     - Stop the session immediately if the patient reports pain, discomfort, or abnormal sensations.
     - Encourage communication throughout the therapy.
     - Monitor for skin irritation or burn dur to DC.
     - Gradually increase intensity as the patient adapts to therapy.
   - **Electrode placement:** Active electrode placed: Over the motor point of the tibialis anterior muscle. Inactive electrode

     (Anode): proximally on the leg.
     Secure electrodes firmly to avoid shifting during treatment.
3. **Clinical Condition:** The patient present with crutch palsy. Functional deficit loss of shoulder abduction, flexion and extension.
   - **Nature of impairment: -** Flaccid paralysis of deltoid muscle due to compression of axillary nerve.
   - **Dosimetry setting:**
     - Current type: Galvanic rectangular pulse.
     - Intensity: Tolerable for the patient, producing visible muscle contraction without discomfort.
     - Duration 10-15 minutes/ session.
     - Pulse duration: 1 pulse per second.
   - **Patient position: -** Sitting on a wooden chair, arm resulting on wooden plinth.
   - **Electrode placement:** positive electrode at the nape of the neck, Negative electrode at the common motor points of deltoid, 2 cm above the deltoid tubercle.

4. **Clinical condition: -** The patient present with fibromyalgia of parascapular muscles or T4 syndrome with functional deficit
   inhibition of Scapular and Shoulder movements, often misdiagnosed as periarthritis of the shoulder joint.

- **Dosimetry Setting: -**
  - Intensity: - Adjusted to patient tolerance (typically mild tingling)
  - Treatment duration: - 10-20 minutes.
  - Current type: Galvanic type rectangular pulses at 100 ms pulse duration at 1 pulse per second.
- **Patient position: -** Sitting on a wooden chair, with head and upper girdle resting on a plinth.
- **Placement of electrode: -** Active electrode at the nape of the neck. Inactive electrode at medial border of scapular on the affected side.

5. **Clinical condition: -** The patient present with Erb's palsy (brachial plexus injury) with the functional loss of shoulder abduction, external rotation, elbow flexion and forearm supination.
   - **Nature of impairment: -** Flaccid Paralysis of the muscles with significant sensory loss.
   - **Nerves involved: -** Erb's palsy (Lesion of c5 nerve root, sometimes C6 root, caused due to traction injury between head and shoulder girdle.
   - **Dosimetry setting: -**
     - Type of Current used: - Interrupted Galvanic current, rectangular pulses at 100-300ms, pulse duration, or selective trapezoidal pulses for prolonged stimulation, at 1 pulse per second.
     - Treatment duration: - 60 contractions in one sitting for each muscle or group with interrupted galvanic.
   - **Patient position: -** Sitting on a wooden chair with the affected extremity resting on a plinth in front of the patient.
   - **Placement of electrodes: -** positive electrode at the para cervical area on the affected side, negative electrode at the motor point of each affected muscle.
   - **Special precautions: -** No traction should be applied to the affected limb while handling because it may cause further injury to the plexus