



JHARKHAND RAI UNIVERSITY
RANCHI

LAB MANUAL

Physiotherapy in Neurological Conditions-II

(23A802P)

Serial No.	Name of the Practical	Page No.
1.	Assessment of neonatal reflexes	2-5
2.	Physiotherapy management of Cerebral Palsy	5-11
3.	Physiotherapy interventions in Stroke rehabilitation	12-20
4.	Physiotherapy management for Facial palsy	21-24
5.	Physiotherapy approach to patients with Cerebellar lesions	25-27
6.	Berg Balance Scale for balance assessment	28-32
7.	Gross Motor Function Classification System (GMFCS)	33-34
8.	Physiotherapy management strategies for Duchenne Muscular Dystrophy	35-37

Practical 1

Aim: To study and understand the onset, testing position, stimulus, response, and integration periods of key spinal and brainstem primitive reflexes, which are essential indicators of neurodevelopment in infants.

Theory

Primitive reflexes are automatic, involuntary motor responses originating in the central nervous system, primarily present in newborns and infants. These reflexes are crucial for survival and development in early life and are typically integrated (inhibited) as the brain matures. They are broadly categorized into spinal and brainstem reflexes:

- Spinal Reflexes originate at the spinal cord level and are typically the earliest reflexes to appear. They are primarily protective and basic in function.
- Brainstem Reflexes are more complex and mediated by higher brainstem centers. They help in motor pattern development and establish the foundation for postural control and coordination.

The persistence or absence of these reflexes beyond their normal integration periods may indicate developmental delays, neurological dysfunctions, or cerebral pathologies. Therefore, reflex testing is an essential component of pediatric neurological assessment, especially in early detection of motor disorders such as cerebral palsy.

Procedure

1. Spinal Reflex: Flexor Withdrawal

- Stimulus: Noxious stimulus (e.g., pinprick) to the sole of the foot
- Tested in: Supine or sitting position
- Response: Toes extend, foot dorsiflexes, entire lower extremities (LE) flex
- Onset: 28 weeks of gestation
- Integration: 1-2 months

2. Spinal Reflex: Crossed Extension

- Position: Supine position
- Stimulus: Noxious stimulus to the ball of the foot of lower extremity fixed in extension.
- Response: Opposite lower extremity flexes, adducts and then extends.

- Onset: 28 weeks of gestation.
- Integration: 1-2 months

3. Spinal Reflex: Traction

- Position: Supine lying.
- Stimulus: Grasp forearm and pull up from supine to sitting position.
- Response: Grasp and total flexion of upper extremity.
- Onset: 28 weeks of gestation
- Integration: 2-5 months

4. Spinal Reflex: Grasp

- Position: Sitting position/ Supine lying
- Stimulus: Maintained pressure to palm of hand (palmar grasp) or to the ball of foot (plantar grasp)
- Response: Maintained flexion of finger or toes.
- Onset: 28 weeks of gestation
- Integration: Palmar: 4-6 months, Plantar: 9 months

5. Spinal Reflex: Moro Reflex

- Position: Supine, head in midline
- Stimulus: Sudden drop of the head in a posterior direction
- Response: Extension and abduction of upper limbs, opening and fanning of fingers, followed by flexion and adduction across the chest
- Onset: 28 weeks of gestation
- Integration: 5-6 months

6. Spinal Reflex: Startle Reflex

- Position: Sitting
- Stimulus: Sudden loud noise or tapping the sternum
- Response: Shoulder abduction, elbow flexion, and hand clenching
- Onset: Birth
- Integration: Persists throughout life, but response pattern changes

7. Brainstem Reflex: Asymmetrical Tonic Neck Reflex (ATNR)

- Position: Supine
- Stimulus: Turning the head to one side
- Response: Extension of arm and leg on face side, flexion of arm and leg on skull side ("fencing position")
- Onset: Birth
- Integration: 4-6 months

8. Brainstem Reflex: Symmetrical Tonic Neck Reflex (STNR)

- Position: Quadruped or supported sitting
- Stimulus: Head flexion or extension
- Response:
 - With head flexion: arms flex and legs extend
 - With head extension: arms extend and legs flex
- Onset: 4-6 months
- Integration: 8-12 months

9. Brainstem Reflex: Tonic Labyrinthine Reflex (TLR)

- Position: Prone or supine
- Stimulus: Head position influences muscle tone
- Response:
 - In prone: increased flexor tone
 - In supine: increased extensor tone
- Onset: Birth
- Integration: 6 months

Conclusion

These reflexes help assess the integrity and development of the central nervous system. Their presence or absence at appropriate developmental stages provides crucial diagnostic information in pediatrics and neurology.

Practical 2

Aim: To enhance functional mobility, postural control, and neuromuscular coordination in children with cerebral palsy through developmentally appropriate physiotherapy interventions and therapeutic positioning.

Theory

Cerebral palsy (CP) is defined as a non-progressive motor disorder due to an early disturbance in the developing fetal or infant brain. It often presents with abnormalities in muscle tone, posture, reflex integration, and motor coordination. Physiotherapy plays a crucial role in managing CP by utilizing neurodevelopmental techniques that encourage normal movement patterns and suppress abnormal reflex activity.

The therapeutic approach involves:

- Facilitating motor milestones such as head control, rolling, sitting, crawling, and walking.
- Utilizing positions such as supine, prone, sitting, quadruped, and standing to promote antigravity control, postural alignment, and balance reactions.
- Applying sensory stimulation, facilitation techniques (e.g., tapping, icing), and proper handling to activate key muscle groups and improve voluntary control.
- Preventing contractures and deformities through stretching, positioning, and functional mobility training.

An individualized treatment plan based on the child's developmental stage, type of CP (e.g., spastic, athetoid, ataxic), and functional goals is essential to achieve optimal outcomes.

Physiotherapy Management

1. Initial Position: Supine

Activity:

Positioning

- Placing a pillow under the knees to induce knee flexion.
- Placing a pillow between the legs in case of tight adductors.

Gaze and Neck Rotation

The child can be made to track objects with his eyes to help develop gaze and neck control.

Reaching and midline crossing activities

- Child is seeking the toy by crossing his arm beyond the midline, this helps to aid activity of daily living (ADL).
- Rolling/Turning.
- Facilitating the pelvis and shoulder for turning.

2. Initial Position – Prone

Activity:

Positioning

- Prone Positioning on wedge with head and upper trunk outside the wedge.
- Head Control Practice
- Gently support head and encourage lifting head so as to look at an object.
- Tracking objects.
- Encourage child to track objects at different heights and directions.

Facilitation of head and trunk for head and trunk extension.

Facilitation techniques such as stroking, fast icing, tapping should be done in the neck extensor and back extensor muscle group.

Reaching

Place toys slightly in /out and this encourages child to reach for objects at different heights.

Pivot Prone

- Encourages child to bend elbows, extend wrists and extend legs outward.
- Gently support child's chest and pelvis if they have difficulty lifting their head or extending limbs.
- Use tactile stimulation (gentle tapping or fast stroking) on back and shoulder to encourage activation of extensor muscle.

3. Initial Position: Sitting

Activity:

- Long sitting with support of Swiss ball
- Long sitting with a wedge under the pelvis to prevent posterior pelvic tilt.
- Cross sitting for adductor tightness - Contracted in case of extensive hip external rotation and abduction.
- Short sitting-Teaching forward flexion of trunk in short sitting to prepare for sit to

stand.

- Rotation of the trunk from left to right in short sitting to develop trunk balance.
- Tilting the trunk forward and backward in a to and fro motion to develop trunk balance.

4. Initial Position: Sit to stand

Activity:

Trunk Balance during sitting

- Patient Position - Normal sitting on chair or bed (Knee flexed 90 with sole of the feet placed on the ground)
- Therapist Position- supporting the child from anterior direction.

a. Forward Lean

Encourage child to lean slightly forward by the nose over their toes. This engages the hip and knee extensors.

Provide tactile for reaching verbal cues like lean forward for reaching a toy.

b. Backward Lean

Encourage child to lean slightly backward by moving their head back to chair support.

c. Side lean (Both Side)

Ask the child to hold the side of chair or bed with both hands then lean over both sides one after the other.

Standing Phase (Extension of Hip and knees)

- The child pushes through their legs to extend knees and hips, lifting off the chair with hand support.
- Avoid excessive pushing with arm: focus on using the leg muscles.
- Encourage an upright posture once standing.
- Holding the standing Position
- The child maintain their weight bearing position for 5 to 6 seconds (progressively increase time)

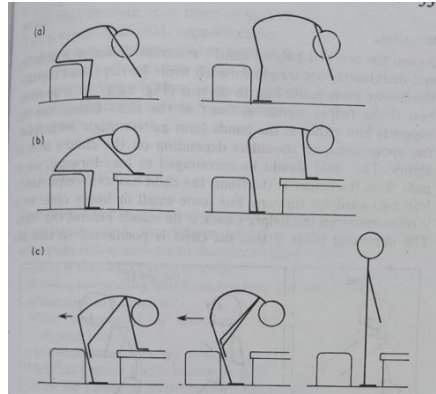


Fig 2.1: Technique for independent sit to stand

5. Initial Position-Quadruped

Activity:

- Mobilization of the lower back, pelvis and shoulder.
- Knee and feet together, bottom resting on heels, arms positioned above the head and nose touching the mat.
- Resist at sacrum, asking the child to push bottom up. Weight bearing on hand and knees.
- Lift one arm off the mat while keeping the other arm supporting their body then switch.
- Assisted crawling

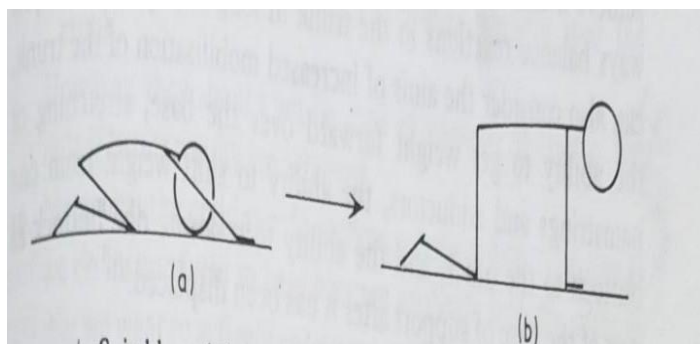


Fig 2.2: Training from prone kneeling to quadruped

6. Initial Position- Walking

Activity:

- Therapist stands in front of child facing him and supports him either at hands, the upper arm or shoulder depending on child's level of ability.
- Correct method to support in front:
- Upper limb of the child should be in an extended position.
- Weight forward
- Therapist's support at elbow or hands.

Precautions-

Do not allow the body to lean back.

Do not encourage the child walking with flexed upper limb.

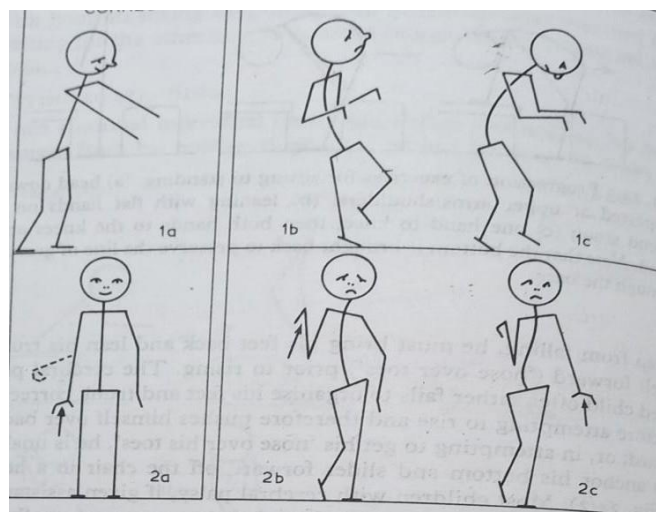


Fig 2.3: Depiction of correct (Left) and incorrect (Right) posture while walking.

Conclusion

Physiotherapy is fundamental in improving motor function, preventing deformities, and enhancing independence in children with cerebral palsy. By utilizing developmentally appropriate positions and guided movement techniques, therapists can promote more functional and efficient motor patterns. Consistent therapy, combined with family education and interdisciplinary care, maximizes the child's potential for mobility and quality of life.

Practical 3

Aim: To restore functional independence, improve postural control, and facilitate motor recovery in post-stroke patients through structured physiotherapy interventions focusing on bed mobility, sitting balance, trunk control, and ambulation.

Theory

Stroke is a leading cause of adult disability characterized by sudden loss of neurological function due to a vascular event in the brain. Motor impairments post-stroke may include muscle weakness, spasticity, loss of selective movement, poor coordination, and balance deficits. Physiotherapy plays a critical role in the rehabilitation process by promoting neuroplasticity—the brain's ability to reorganize and form new neural connections.

Rehabilitation techniques emphasize:

- Facilitation of normal movement patterns and inhibition of abnormal synergy patterns.
- Progressive weight-bearing activities to retrain proprioception and balance.
- Functional task training to promote independence in activities of daily living (ADLs).
- Positioning and guided movement to prevent contractures and secondary complications such as pressure sores or learned non-use.

An early, task-oriented, and patient-centered physiotherapy plan fosters recovery by activating the affected hemisphere and encouraging the patient's active participation.

Physiotherapy Management

1) Activities in Lying

a) **Elongation of trunk**

- The Patient lies in half crook lying with his affected leg flexed and adducted.
- Place one hand on his pelvis, the other hand over his shoulder and elongate his trunk until his hip remains forward off the bed.

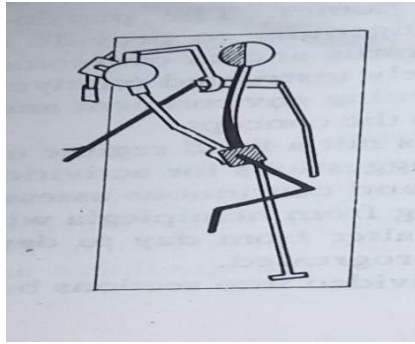


Fig 3.1: Elongation of trunk

b) Movement of Scapula

- Place one hand over his scapula, the other supporting his arm.
- Protract his shoulder and slowly elevate and depress his scapula until spasticity releases and it moves freely.
- Ease patient arm into lateral rotation while moving scapula.

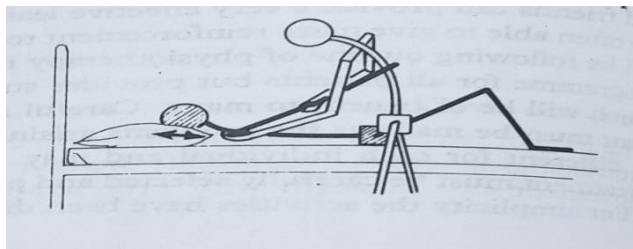


Fig 3.2: Therapist assisted movement of scapula

c) Elevation of arm

- Maintaining lateral rotation at shoulder, extend patient's elbow and lift his arm into elevation.
- Continue until full elevation is obtained with supination of forearm, extension of wrist and fingers and wide abduction of thumb.

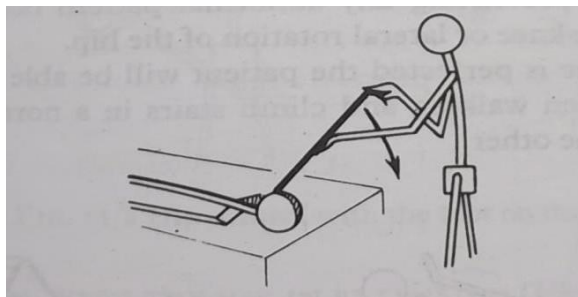


Fig 3.3: Therapist assisted arm elevation.

d) Self-Assisted Arm movement

- Teach the patient at an early stage to clasp his hand together interlacing the fingers and to lift them up into full elevation.
- The movement should begin with protraction of shoulder and extension of elbow.
- The patient must be encouraged to perform this activity frequently throughout day and continue this when in sitting position.

e) Moving the leg

- Hip and knee flexion over the side of bed
- Placing patient's leg over the side of bed with his hip extended, knee flexed and foot in full dorsiflexion until there is no resistance.
- Maintain the position of foot and knee and guide the leg up on THE bed.
- Repeat the movement preventing any abnormal pattern occurring i.e. extension of knee or later rotation of hip.

f) Knee extension with dorsiflexion

Hold the patient's foot in dorsiflexion and move his leg from full flexion into extension without his toe pushing down and rotation at the hip.

g) Hip control with hip in extension.

In half crook lying, patient's affected leg is flexed and adducted. The patient lifts his affected leg forward off the bed and while maintaining hip extension moves his knees in and out.

h) Bridging

- Bridging with rotation of pelvis – Maintaining good extension at hip, the patient rotates his pelvis equally to either side while preventing any associated movements in affected leg.
- Bridging on affected leg- The patient bridges on both leg and lifts his sound foot off the bed while maintaining the same position of pelvis and affected leg.

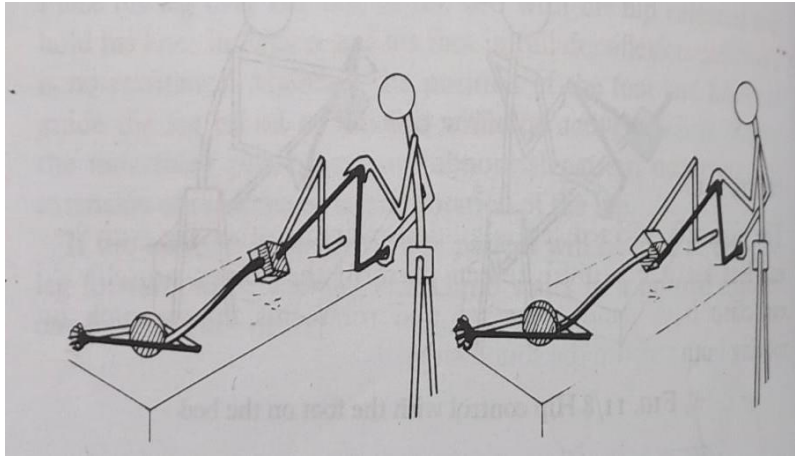


Fig 3.4: Technique for pelvic bridging.

i) Rolling

To affected side- Place patient’s affected arm in abduction and ask him to lift his head and bring his sound arm across to touch his other hand. Instruct him to lift his sound leg across his affected leg without pushing off bed. (Facilitate patient’s back muscles in order to help rolling on the bed.)

To sound side- Guide the patient’s affected leg over his sound leg such that the foot is hooked underneath the sound leg. Patient will clasp both hand and rotates his upper trunk by moving both arms to sound side.

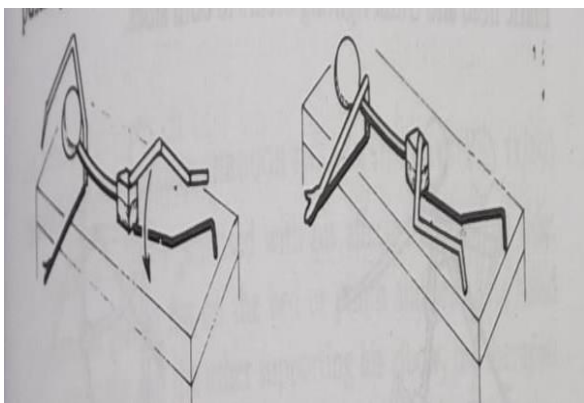


Fig 3.5: Technique for rolling to the affected side.

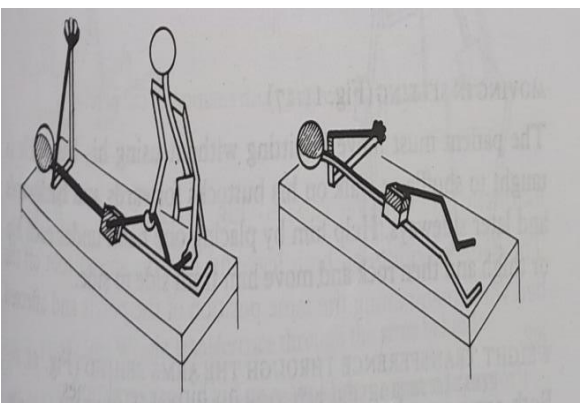


Fig 3.6: Technique for rolling to the unaffected side.

2. Activities in sitting

a) Weight transference from side to side; feet unsupported.

- Sit on patient's affected side and draw his body towards you so that his body weight passes through one buttock only.
- Shift his body weight over his sound side and place head in position. Facilitate side flexion of patient's trunk on affected side by giving pressure at waist with hand and encourage lifting his buttock clear of bed.

b) Moving in sitting

- The patient must move in sitting without using his hand.
- Teach patient to shuffle or scoot in different directions.

c) Weight transference through the arm behind

- Take patient's arms carefully behind his trunk and facilitate extension using sharp push-pull action up through his arm until they support his weight.
- Progress by shifting patient's weight from one side to other without his elbow bending.

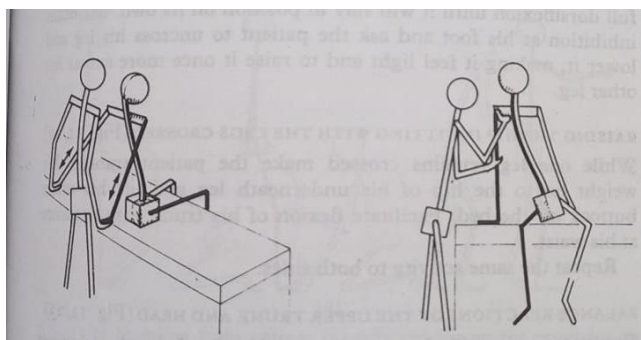


Fig 3.7: Technique for weight transference through upper limb.

d) Raising the hip sitting with legs crossed

- Cross one leg over the other and make the patient transfer his weight on his underneath limb's hip and lift his other buttock off the bed.
- Facilitate flexion of patient's trunk with pressure at his waist.

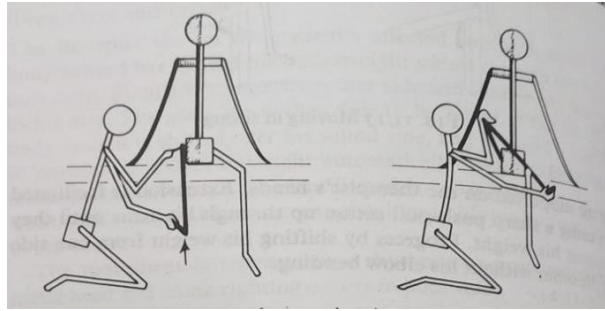


Fig 3.8: Technique for raising the hip and weight transference.

e) Balance reaction of upper trunk and head.

- Facilitate increased balance reaction of patient's head, trunk and upper limb by lifting both legs together and rotating them to either side.
- Alter the speed and position to obtain required reaction in rest of body.

f) Standing from a high bed or plinth to ground.

- The patient wriggles to the edge of bed and places his affected leg on floor without his foot pushing down.
- When his affected foot is on floor, the patient is asked to practise isolated knee extension before bringing hip forward to take full weight through the leg.
- Do not allow patient's affected knees to snap into extension as his sound leg is taken off the bed.

g) Standing from chair

- Place patient's feet together with affected foot slightly behind the sound one to ensure good weight bearing as patient comes to standing.
- Make patient lean forward until his head is vertically in front of his feet and to stand without pushing up with his hand.
- While returning to sitting, his affected foot remains behind and his head is kept well forward while his bottom is placed far back on the chair.

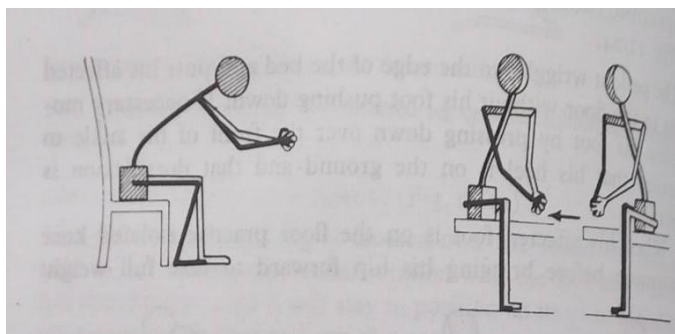


Fig 3.9: Technique for training sit to stand.

3. Trunk Control

With patient hand clasped in front of him, and elbow extended, patient can practice reaching out at either side.

4. Activities in Standing

a) **Weight bearing on affected leg-**

- The therapist's stands on the affected side of the patient and draws his weight over himself to give maximum support. The patient is asked to step forward with his sound leg while preventing his knee from snapping back into extension.
- Similarly, patient is asked to place his sound feet on and off a step kept in front.
- Still preventing knee from locking back, the patient is asked to draw large letter on floor ensuring weight bearing on affected the leg.

b) **Releasing the knee and moving hemiplegic leg**

- The patient stands with his feet close together. The therapist guides the patient's pelvis forward and down to release his knee on the affected side. The patient is then instructed to straighten it again without pushing his trunk back.
- Practice the same activity in step standing with the patient's affected leg behind and weight forward over his extended sound leg.

5. Stairs Activity

a) **Ascending**

Support patient's affected knee as he steps up with his sound leg and keep his weight well forward.

b) **Descending**

Guide the patient's pelvis well forward on his affected side as he places his foot down, preventing leg pulling into adduction. Therapist's hand on patient's knee will give support as the patient steps down with his sound leg.

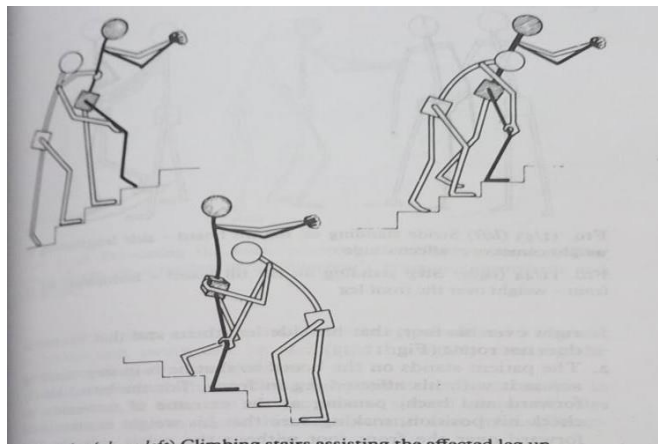


Fig 3.10: Technique for training stair climbing.

Conclusion

A comprehensive, position-based physiotherapy approach after stroke facilitates functional recovery, improves neuromuscular control, and promotes independence. Through sequential training—from lying to standing—patients relearn motor skills, regain strength, and develop coordination for daily activities. Therapist guidance, frequent repetition, and emphasis on normal movement patterns are essential for effective stroke rehabilitation. Empowering patients to actively participate accelerates their progress and supports long-term outcomes.

Practical 4

Aim: To restore facial symmetry, improve voluntary facial muscle control, reduce muscle stiffness, and prevent complications such as contractures or synkinesis in individuals with facial palsy through targeted physiotherapy interventions.

Theory

Facial palsy is a neuromuscular condition resulting from damage to the facial nerve (cranial nerve VII), leading to partial or complete loss of voluntary facial movements. It may be caused by trauma, infections, tumours, or idiopathic as in Bell's palsy, where inflammation and compression of the facial nerve near the stylomastoid foramen lead to acute facial weakness.

The primary goals of physiotherapy include:

- Stimulating neuromuscular activity through electrical and manual techniques.
- Re-educating facial muscles to regain coordination and symmetry.
- Preventing muscle atrophy and stiffness through active movement and massage.
- Enhancing patient independence by teaching eye care, facial exercises, and home routines to improve quality of life.

Understanding the dynamics of facial expression and adopting a mirror-based feedback system helps patients relearn motor control in affected facial regions, promoting neuroplasticity and functional recovery.

Facial Palsy: It is a condition characterized by weakness or paralysis of the muscles on one side of the face due to damage or dysfunction of the facial nerve (cranial nerve VII), which controls facial movements.

Symptoms of Facial Palsy-

- Inability to close the eye completely.
- Inability to move the lips (e.g., into a smile, pucker)
- At rest, the affected side of the face may “droop”.
- Drooling of saliva
- Ectropion i.e., the lower eyelid may droop
- Loss of taste or altered taste sensation
- Increased sensitivity to sound on affected side
- Difficulty in speaking

Bell's Palsy: It is characterized by an acute paralysis of the face related to inflammation and swelling of the facial nerve within the facial canal at the stylomastoid foramen. It is usually unilateral.

Symptoms of Bell's Palsy-

- Wrinkles not formed
- Bell's Phenomenon: Movement of eyeball laterally and upward when asked to close the eyes.
- Crocodile tears
- Nasal flaring
- Drooling of saliva
- Not able to close eyes completely.

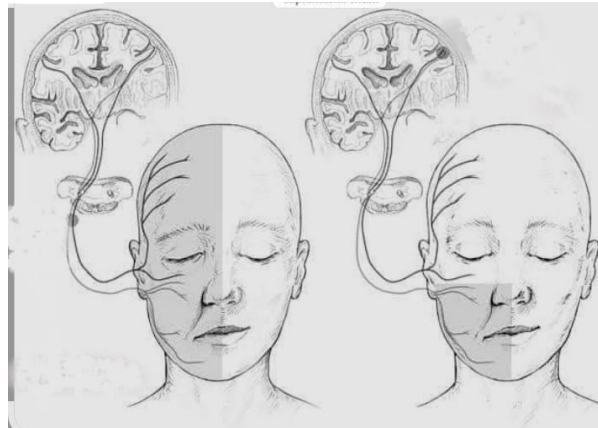


Fig 4.1: Depiction of area involved in Bell's palsy and Facial palsy

Physiotherapy Management

1) Electrical Stimulation

The electrical stimulation unit provided 1 channel for bipolar electrical stimulation at a fixed 80 Hz and fixed biphasic pulse duration of 700 microseconds.

The intensity was gradually increased from 0.5 mA until the therapist confirmed the visible muscle contraction and the subject felt a grabbing sensation in facial muscles.

2) Massage

- Stroking
- Effleurage
- Kneading
- Effleurage
- Hacking
- Effleurage
- Wringing Up
- Effleurage

3) Exercises

- Sit relaxed in front of mirror then gently raise eyebrows.
- Draw eyebrows together, frown.
- Wrinkle up nose.
- Gently try and move corners of the mouth outward.
- Fill up cheek with air.

4) Other Activities

- Balloon inflation
- Blowing out candle
- Gargling
- Drink with straw
- Chewing simulation
- Side-to- side jaw movements
- Lips pursuing

- Cheek Puffing
- Eye squeezing
- Bubble blowing
- Practicing vowel sound like aa,ee,oo,oh,uh etc.

Home advices

1. Protect the eye: If eyelid closure is weak or absent.
 - Use lubricating eye drops during the day.
 - Apply eye ointment at night to prevent dryness.
 - Wear glasses or an eye patch to protect from dust and injury
2. Facial Exercises should be regularly done at home.
3. Use Warm Compresses: Apply a warm towel to relax muscles and improve circulation.
4. Eat soft foods if chewing is difficult.
5. Do not wash face with cold water

Conclusion

Physiotherapy plays a pivotal role in the recovery from facial palsy by combining electrical modalities, therapeutic massage, and structured facial muscle exercises. Early intervention, regular practice, and patient education can significantly reduce disability, restore facial symmetry, and improve psychosocial well-being. Multidisciplinary collaboration and patient adherence are key to optimizing outcomes.

Practical 5

Aim: To improve balance, coordination, and functional mobility in patients with cerebellar lesions through targeted physiotherapeutic strategies that incorporate both compensatory and restorative approaches.

Theory

Cerebellar lesions—resulting from stroke, tumours, trauma, infections, or degenerative conditions—lead to impairments in coordination, balance, and gait due to disruption of the cerebellum's role in motor control. Patients may present with ataxia, dysmetria, intention tremors, and gait instability, significantly affecting independence and safety.

Two primary physiotherapeutic approaches are used:

- **Compensatory Approach:** Focuses on reducing functional limitations by using orthotic devices, environmental modifications, and simplifying movement patterns (e.g., reducing degrees of freedom).
- **Restorative Approach:** Targets recovery by addressing the underlying impairments through active rehabilitation strategies including strength training, balance retraining, and coordination exercises.

Optimal management often combines both approaches, aiming to promote neuroplasticity, prevent secondary complications such as falls, and improve patient quality of life.

Physiotherapy Management

Key Physiotherapy Strategies

- **Fall Prevention:** Crucial in cerebellar disorders. Regular risk assessment and safety education are essential.
- **Dynamic Task-Oriented Training:** Exercises that challenge postural stability and encourage exploration of the body's stability limits help enhance motor learning and balance.
- **Reduction of Upper Limb Support:** Gradual withdrawal of arm support to encourage trunk and lower limb balance reactions.
- **Strength and Flexibility Training:** Builds foundational support for coordination and gait control.
- **High-Intensity Training:** Associated with more significant functional gains when applied consistently and progressively.

Specific Interventions for Balance and Gait

1. Video-Game Based Coordinative Training

- Engages patients, especially children with progressive ataxia, in full-body controlled movements.
- Enhances motivation and neuro-motor coordination.

2. Treadmill Training

- Intensive and prolonged treadmill sessions, supplemented with overground walking, improve gait symmetry and endurance.

3. Visually Guided Stepping

- Encourages patients to visually plan foot placements before stepping, particularly in cluttered environments, to enhance safety and spatial accuracy.

4. Balance and Mobility Aids

- Case-by-case use of walking aids; light fingertip somatosensory cues (e.g., using a cane or wall touch) can improve postural awareness and reduce fall risk.

Examples of Therapeutic Exercises

- Lying Bent Knee Rotations: Enhances segmental control of lower limbs, assists with bed mobility and rolling.
- Kneeling Press-Ups: Improves upper body control and strength; prepares patient for upright posture.
- Quadruped Weight Shifting: Develops postural balance and trunk control during transitions.
- Vestibular Ball Activities: Engages core stability and reactive balance.
- Standing Heel-to-Toe Balance: Trains static and dynamic balance reduces base of support for challenge progression.

Conclusion

Physiotherapy plays a vital role in the multidisciplinary management of cerebellar lesions. A comprehensive, individualized approach involving task-specific training, coordination exercises, balance aids, and compensatory strategies can significantly enhance patient function and safety. Early, consistent, and high-intensity interventions lead to better motor learning and long-term outcomes in patients with cerebellar dysfunction.

Practical 6

Aim: To assess an individual's balance performance through functional tasks in order to identify their risk of falling and to guide treatment planning, particularly in older adults and individuals with balance impairments.

Theory

The Berg Balance Scale (BBS) is a widely used clinical assessment tool designed to evaluate balance and predict fall risk. It measures both static and dynamic balance through a series of 14 tasks of increasing difficulty.

- Areas of Assessment:
 - Balance (static and dynamic)
 - Functional mobility
- Scoring:
 - Each item is scored on a 0–4 scale based on ability and safety
 - Maximum total score: 56
 - Higher scores reflect better balance and lower fall risk
- Time to Administer: 15–20 minutes

Equipment Required

- Stopwatch
- Two chairs (one with armrests, one without – both standard height: 18–20 inches)
- Step or stool (height: 7.75–9 inches)
- Ruler
- Slipper or shoe

Instructions and Scoring Criteria

1. Sitting to Standing

Instruction: “Please stand up. Try not to use your hands for support.”

- (4) Stands without using hands and stabilizes independently
- (3) Uses hands but stands independently

- (2) Needs multiple attempts using hands
 - (1) Requires minimal assistance
 - (0) Requires moderate or maximum assistance
2. Standing Unsupported
- Instruction:* “Please stand for two minutes without holding on.”
- (4) Stands safely for 2 minutes
 - (3) Stands for 2 minutes under supervision
 - (2) Stands for 30 seconds unsupported
 - (1) Several attempts needed for 30 seconds
 - (0) Cannot stand unsupported for 30 seconds
3. Sitting with Back Unsupported (Feet Supported)
- Instruction:* “Sit with arms folded for 2 minutes.”
- (4) Sits safely for 2 minutes
 - (3) Sits 2 minutes under supervision
 - (2) Sits 30 seconds
 - (1) Sits 10 seconds
 - (0) Unable to sit 10 seconds without support
4. Standing to Sitting
- Instruction:* “Please sit down.”
- (4) Sits safely with minimal hand use
 - (3) Controls descent using hands
 - (2) Uses back of legs against chair
 - (1) Uncontrolled descent
 - (0) Needs assistance to sit
5. Transfers
- Instruction:* “Transfer from one chair to another (one with armrests, one without).”
- (4) Transfers safely with minor hand use
 - (3) Transfers safely using hands
 - (2) Verbal cueing/supervision needed
 - (1) One person assists
 - (0) Two-person assist or unsafe
6. Standing Unsupported with Eyes Closed
- Instruction:* “Close your eyes and stand still for 10 seconds.”
- (4) Stands 10 seconds safely

- (3) Stands 10 seconds with supervision
- (2) Stands 3 seconds
- (1) Eyes close <3 seconds but remains safe
- (0) Needs help to avoid falling

7. Standing with Feet Together

Instruction: “Place feet together and stand without holding on.”

- (4) Stands 1 minute safely
- (3) Stands 1 minute with supervision
- (2) Cannot hold 30 seconds
- (1) Needs help to attain position, holds 15 seconds
- (0) Cannot attain/hold position

8. Reaching Forward with Outstretched Arm

Instruction: “Reach forward with arm at shoulder height as far as you can.”

- (4) Reaches ≥ 25 cm (10 inches)
- (3) Reaches 12 cm (5 inches)
- (2) Reaches 5 cm (2 inches)
- (1) Needs supervision
- (0) Loses balance/requires support

9. Pick up Object from Floor

Instruction: “Pick up the slipper placed in front of your feet.”

- (4) Picks up safely
- (3) Picks up with supervision
- (2) Reaches near the object, keeps balance
- (1) Needs supervision
- (0) Cannot attempt or needs help

10. Turn to Look behind Over Shoulders

Instruction: “Look behind over both shoulders.”

- (4) Looks both sides with weight shift
- (3) One side good, one side limited
- (2) Partial turn, maintains balance
- (1) Needs supervision
- (0) Needs assistance

11. Turn 360 Degrees

Instruction: “Turn a full circle in both directions.”

- (4) Turns both directions in ≤ 4 seconds
- (3) One direction only in ≤ 4 seconds
- (2) Turns both directions, slow
- (1) Needs cueing/supervision
- (0) Needs assistance

12. Alternate Foot on Stool

Instruction: “Step on and off stool with each foot 4 times.”

- (4) 8 steps in ≤ 20 seconds
- (3) 8 steps in > 20 seconds
- (2) 4 steps, needs supervision
- (1) > 2 steps with assistance
- (0) Needs help or unable

13. Standing with One Foot in Front (Tandem Stance)

Instruction: “Place one foot directly in front of the other.”

- (4) Holds tandem position 30 seconds
- (3) Feet aligned, 30 seconds
- (2) Small step, 30 seconds
- (1) Needs help stepping, holds 15 seconds
- (0) Loses balance

14. Standing on One Leg

Instruction: “Stand on one leg as long as you can.”

- (4) Holds > 10 seconds
- (3) Holds 5–10 seconds
- (2) Holds ≥ 3 seconds
- (1) Lifts but can't hold 3 seconds
- (0) Needs help or unable

Interpretation of Total Score (Max = 56)

Score Range Fall Risk

41–56 Low fall risk

21–40 Medium fall risk

0–20 High fall risk

Conclusion

The Berg Balance Scale is a reliable and validated clinical tool for assessing functional balance and identifying individuals at risk of falls. It plays a critical role in fall prevention strategies, rehabilitation planning, and outcome monitoring. Regular use of the BBS can help clinicians implement timely interventions to improve stability, enhance mobility, and promote patient safety in various populations, especially the elderly and neurologically impaired.

Practical 7

Aim: To systematically classify the severity of gross motor function in children with cerebral palsy (CP), providing a standardized framework to describe current movement abilities and assist in planning intervention, setting goals, and predicting future mobility needs.

Theory

The Gross Motor Function Classification System (GMFCS) is a five-level standardized system developed by the Canadian Institute of Health Research and Can Child Centre for Childhood Disability Research. It categorizes motor function in children and youth with cerebral palsy based on self-initiated movement, particularly sitting and walking. The classification emphasizes usual performance in home, school, and community settings, not the child's best capacity.

Each level describes a child's typical abilities and limitations in motor function:

GMFCS Levels

GMFCS Level I

- Walks without limitations
- Climbs stairs without railing
- Able to run and jump, but with limited speed, balance, and coordination

GMFCS Level II

- Walks in most settings
- Requires a railing for stairs
- May need a handheld mobility device or wheelchair for long distances
- Limited ability with gross motor skills like running and jumping

GMFCS Level III

- Walks with a handheld mobility device in indoor settings
- May climb stairs with assistance
- Uses wheeled mobility for longer distances (may self-propel for short distances)

GMFCS Level IV

- Mobility requires physical assistance or powered mobility
- May walk short distances with help at home
- At school or in the community, primarily uses powered mobility or is transported

GMFCS Level V

- Transported in a manual wheelchair in all settings
- Severe limitations in head and trunk control and movement of limbs
- Depends on others for positioning and mobility

Conclusion

The GMFCS provides a clear, age-based classification system that is essential for clinical decision-making, prognostic understanding, and goal setting in children with cerebral palsy. It supports healthcare professionals and families in understanding the child's functional motor abilities and guides the selection of appropriate therapy, mobility aids, and long-term planning. Its consistent use facilitates effective communication, research standardization, and service provision.

Practical 8

Aim: To assess and implement physiotherapy interventions for individuals diagnosed with Duchenne Muscular Dystrophy (DMD) at different stages of disease progression, with the goal of maintaining functional independence, preventing complications, and enhancing quality of life.

Theory

Duchenne Muscular Dystrophy (DMD) is a severe X-linked recessive neuromuscular disorder characterized by progressive muscle degeneration and weakness, typically evident in early childhood. It is caused by mutations in the dystrophin gene, resulting in the absence or deficiency of dystrophin—a protein essential for muscle fiber integrity.

Initial signs include proximal muscle weakness, delayed walking, toe walking, and frequent falls. The hallmark clinical feature is Gower's Sign, indicating difficulty in rising from the floor due to hip and thigh muscle weakness.

As the disease progresses, complications such as osteoporosis, joint deformities, respiratory dysfunction, and cardiomyopathy may arise. Physiotherapy plays a vital role in slowing the progression of disability, managing complications, and maintaining the individual's independence through targeted interventions tailored to each disease stage: ambulatory, wheelchair-bound, and bedridden.

Clinical Problem List:

- Proximal muscle weakness (initial stage)
- Difficulty in walking, running, and climbing stairs
- Delayed initiation of walking
- Toe walking
- Frequent falls
- Waddling gait
- Positive Gower's Sign

Complications:

- Osteoporosis
- Joint and spinal deformities
- Respiratory and chest complications
- Cardiomyopathy

Physiotherapy Management

i) Ambulatory Stage:

Goals:

- Educate parents and caregivers
- Multidisciplinary evaluation
- Maintain muscle strength and power
- Improve posture
- Prevent contractures
- Gait and balance training using assistive devices

Strategies:

- Postural Monitoring: Encourage prone lying and long sitting to stretch hip flexors and hamstrings.
- Stretching and Strengthening: Include active/passive ROM exercises and low-load resistance training.
- Gait Training: Use of KAFOs, walkers, and stair training.
- Balance Training: Core and lower limb strengthening; may use AFOs for support.

ii) Wheelchair-Bound Stage:

Goals:

- Nutritional management
- Contracture and postural deformity prevention
- Prevent pressure sores and respiratory complications

- Wheelchair skill training

Strategies:

- Diet: Ensure calcium, Vitamin D, fluid, and fiber intake.
- Contracture Prevention: Use of splints and optimal positioning.
- Posture Management: Use of proper wheelchair and braces.
- Pressure Sore Prevention: Pressure relief techniques and cushioning.
- Respiratory Care: Diaphragmatic and thoracic expansion exercises.
- Bladder Care: Hygiene and catheterization training.

iii) Bedridden Stage:

Goals:

- Prevent muscle atrophy
- Avoid contractures and bed rest complications
- Provide psychological support

Strategies:

- Muscle Maintenance: Passive and assisted movements; upper limb activity.
- Bed rest Complications: Regular vital monitoring, position changes, breathing and ankle exercises, oedema management.
- Contracture Prevention: Prone lying, long sitting, and use of splints.
- Psychological Support: Counselling for child and family to maintain morale and emotional wellbeing.

Conclusion

Physiotherapy in Duchenne Muscular Dystrophy is essential across all stages of disease progression. Through tailored interventions focused on posture, muscle maintenance, respiratory function, and psychological support, physiotherapists play a critical role in improving functional capacity and quality of life.

REFERENCES:

Cash's textbook of Neurology for Physiotherapists (4th Edition)

Physical Rehabilitation by Susan B. O'Sullivan (7th Edition)