Neuropathy: The Burning Question – How Do I Help Balance, Strength and Function?

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California State PT Association

Course Objectives

- Identify the various forms of peripheral neuropathy (PN)
- Briefly discuss pathophysiology for each of the major forms of PN
- Identify evidence based outcome measures for strength, endurance, gait speed, balance, and quality of life
Course Objectives cont.

- Discuss safe and effective exercises for the aging adult in each of the areas
- Present video case studies to best promote clinical application of these concepts
- Present ideas for managing pain in PN
- Provide evidence and application of direct, indirect, compensatory neuropathy intervention
- Stimulate research in this area

Peripheral Neuropathy

Damage to peripheral nervous system resulting in weakness, impaired sensation, and/or pain
- Diabetic
- Vitamin B12 deficiency
- Toxin or medication induced (Chemotherapy, etc)
- Spinal stenosis
- Familial (Charcot Marie Tooth)
DPN

- 18.82 million Type I & II (6.3% population)
- 23.8% of individuals 60+
- 60-70% with DPN
- Etiology – chronic hyperglycemia resulting in microvascular abnormalities cause nerve damage
- Special considerations for intervention

Vitamin B12 deficiency

- Incidence – 5-10% of elderly, increases with age
- Etiology – decline in intrinsic factor (promotes vitamin B12 absorption)
- Necessary to maintain integrity of nervous system
  - Oral supplementation or injections
- Considerations for intervention
Toxic or medication-induced

- Incidence – 1/3 of chemotherapy pts
- Etiology: chemotherapy
  - Prevention - IV calcium and magnesium (Ca/Mg) infusions and glutathione
  - Treatment – topical pain relievers and serotonin and norepinephrine reuptake inhibitors
- Considerations for intervention
  - Increased risk of falls with each cycle
Spinal Stenosis

- Incidence – up to 21% in retirement communities
- Etiology – may be congenital or acquired (degenerative)
  - Narrowing of spinal canal
  - Pain (legs and/or back), weakness, tingling, numbness
- Considerations for intervention

Familial - CMT

- Incidence – 40 per 100,000 in US
- Etiology – genetic mutation causing demyelination of peripheral nerves
  - Affects motor and sensory pathways
  - High arches
  - Limited ROM
- Considerations for intervention
International Classification of Function (ICF) Model

Guide to PT Practice
- Pattern 5F
- Disorders of the peripheral nervous system
Body functions and structures

Primary or secondary impairments

ROM
Strength
Sensation
Pain

Activities

- Abilities and limitations
- Walking
- Feeding
- Dressing
- Selfcare related functions
Participation

- Personal maintenance
- Mobility
- Exchange of information
- Social relationships,
- Home life and assistance to others
- Education
- Work and employment
- Economic life
- Community, social, and civic life

Modifying factors – easily overlooked!

- Environmental – external variables
- Personal – internal variables

Case Study
Case study

- 2MWT – 435 ft
- Berg – 44/56 – unable to SLS, tandem, and impaired with EC, nudge, alt. step touch
- Tandem walk test -23.33 sec with 7 errors
- DGI – 18/24
- FSST – 15.71 sec

Outcome Measures

Exam of the WHOLE person!!
Consistent with the ICF:
- Impairments
- Function
- Quality of Life

Sensation

- Monofilaments
- Proprioception
- Vibration
- Pain
ROM
- Gastroc/soleus
- Lumbar spine mobility
- Hamstrings

Strength
- Tib anterior (toe tapping test)
- Gastroc
- 1 RM/8 RM
- Sit to stands
- Stairs

Balance
- BESTest/Mini BEST
- Berg
- Modified CTSIB
- Four square step test
- Alternate step touch
Gait
- DGI/FGA
- TUG
- 3m/10m walk test

Endurance
- 2 min/6 min walk test
- 400 m walk test
- 2 min step test
- Additional quantifications: BORG, spO2, HR

Quality of life/Self-efficacy
- ABC
- FES
- Quality of life scales: patient specific
  (No gold standard in PN due to the array of etiologies – diabetes, cancer, stenosis, etc.)
Interventions in Neuropathy

- Direct – resolving impairment
- Indirect – decreasing complications
- Compensatory – improve alternative systems

DIRECT Interventions

Direct – resolving impairment

Local blood flow, integument, nerve function

Direct interventions

- Condition-specific
  - Vit B12 supplementation (oral, injections)
  - Chemo support meds
  - Direction-specific exercises (spinal stenosis)
  - LASER
Indirect Interventions

- Indirect – decreasing first order complications
- ROM, dorsiflexor strength, pain, edema

Interventions in Neuropathy: COMPENSATE

- Balance: improve alternative sensory systems
- Training with an assistive device
- Endurance: reduce fatigue-induced imbalance
- Strengthen unaffected muscles: core, proximal

Balance

- Fall prevention
- Fear of falling with resultant inactivity
- Quality of life
- Cost of supervision
- Ideas for core stabilization in neuropathy
- Somatosensory re-weighting
Endurance

- Community access
- Cardiovascular health
- Safety in mobility: should never be endurance-dependent. This is trainable. Balance and strength are needed throughout the day…not just morning
- Ideas for endurance training in neuropathy

Strength

- No one falls because they’re too strong
- Relationship to fall prevention
- Bone density
- Independence (home entry/sit to stand)
- Activity level
- Ideas for strengthening in neuropathy

Getting to the CORE

- Controlling the center of mass
- Static: building resources
- Dynamic: functional training and NM re-education
- Direction-specific exercises
- Ideas for core stabilization in the imbalanced
Gait speed
- Relationship of gait speed to fall risk
- Community access
- Reaction times, etc
- Ideas for gait speed training in neuropathy

Aquatic therapy
- Another option for pain management
- Balance and gait training options

Assistive Devices
- Bracing and assistive devices
- Adding bases to help with balance
- Choosing the right device and brace
Case study

- 2MWT – 435 ft
- Berg – 44/56 – unable to SLS, tandem, and impaired with EC, nudge, alt. step touch
- Tandem walk test -23.33 sec with 7 errors
- DGI – 18/24
- FSST – 15.71 sec

Case study

- 2MWT – 435 ft → 510 ft
- Berg – 44/56 → 51/56
- Tandem walk test -23.33 sec with 7 errors → 10.78 sec with 0 errors
- DGI – 18/24 → 19/24
- FSST – 15.71 sec → 10.14 sec

Future Research

- Define appropriate balance interventions for PN
- Fall risk correlation
- Independence and quality of life with intensive training
- Pain management and modalities
Home programs: Self measurements to drive intensity on their own

- Sit to stand repetitions
- Weights/repetitions
- Gait speed
- 6 minute walk test
- Task specific dual tasking
- Others....

References


• The women’s health and aging study. NIH Public Access.


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