Neurological Examination

A Vital Yet Often Misunderstood Part of Your Examination

The Importance of Nerves

- Every muscle movement is controlled by nerves
- Pain sensations are detected by nerves
- Abnormal movements are brought about by nerves
- Understanding where the nerves are and what they do will help in diagnosis

Neurodynamics

"Concerned with the interrelationship between the physiology and mechanics of the nervous system and associated connective tissues (eg dura, nerve root sleeves, epineurium, perineurium etc)"

Shacklock, 1995

Physiological Functions of Nervous System

- Impulse conduction – upper and lower motor neurons
- Production and secretion of neurotransmitters
- Cytoskeletal function to maintain physiological status of neural tissues and to respond to demands from target tissues

Mechanical Function of Nervous System

- Relate to requisite mechanisms nerve fibers and associated connective tissues utilize for adapting to limb and body movements
- Mechanical functions dependent on anatomical design and visco-elastic characteristics of associated connective tissues

Indications During Initial Exam

- Symptoms extend past tip of acromion, interscapular area gluteal fold or groin.
- Symptoms referred from spine
- Weakness, numbness, tingling
- Symptoms of spinal cord compression or UMN issue
- History of referred symptoms
- Worsening of symptoms or questionable stability

What Do You Test?

- Gross Motor Power
  - Maximal resistance to elicit symptoms
- Nerve Roots
  - Loss of power in myotomes
  - Loss of sensation in dermatome
  - Loss of reflex

What Do You Test?

- Peripheral nerves
  - Loss of power in muscles supplied
  - Loss of sensation in skin supplied

What Do You Test?

- Spinal Cord
  - Babinski sign
  - Clonus: wrist and/or ankle

Pain Sensations

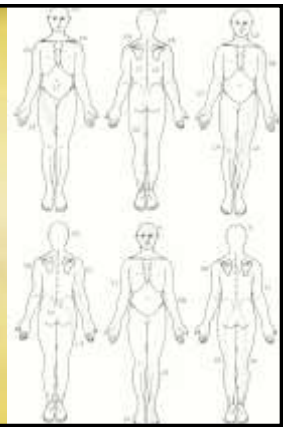
- In each person, nerves run along certain courses
- Knowing where each nerve runs and what it affects will help locate potential problem areas

Pain Sensations

- Without this knowledge you will be unable to link distal symptoms with the central cause
- Nerves innervate superficial structures as well as muscles and joints
- Need to know your dermatomes

Dermatomes

- Dermatomes are the skin innervation pattern of the spinal nerves.
- Knowledge of these patterns can indicate which nerve is involved and hence which spinal level is affected.



Neurological Signs/Changes

- 'Signs' are subjective observations
- 'Changes' are objective physical deficiencies
- 'Signs' may be unreliable as they are reliant upon the patient's report of what is happening

Neurological Signs/Changes

- 'Changes' are measurable and reproducible
- When a PT notices deterioration in 'Changes' then action needs to be taken
- Constant reassessment of 'Change' is essential

Referred Pain

- Referred pain with its origin at the nerve root is known as 'Radicular Pain'
- Can be caused by compression of nerve roots
- Or can be caused by other spinal structures
- Difficult in identifying the precise cause
- Not just an ache, but described as pain and usually severe

Referred Pain

- Severity of pain can cause the patient to alter their gait or posture
- May be described as a sickening intense pain
- Most frequently this pain is most intense in the distal part of the distribution

Assessing Radicular Pain

- May not be increased by active movement but often increases AFTER movement
- May be elicited if a particular movement is held at the limit of range
- Referred pain from other sources usually does not behave in this way

Nerve Root Pain

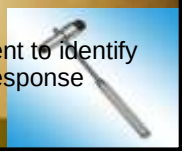
- Very often nerve root pain is felt in the distal part of the dermatome
- Pain may begin distally even though the problem is central
- Other patients will complain of pain from the spine to the distal aspect
- Distal pain is probably nerve root, central pain may be another structure, such as disc

Muscle Involvement with Nerve Root Pain

- Isometric (static) resisted contractions are best to assess weakness associated with nerve root compression
- Some muscles are supplied by more than one root but the major supplier is considered to be at fault in this case
- Testing this type of weakness may require some time to fully understand the nature of the problem

Reflexes and Their Assessment

- Reflexes are assessed to identify nerve root compression
- Reflexes that are tested include the biceps and triceps reflexes in the upper limb and the knee and ankle jerk in the leg
- Normal reflex activity cannot be determined without repeated tapping
- Six repetitions should be sufficient to identify the briskness or fatigue of the response



Movement Testing of Pain Sensitive Structures

- Full flexion of the spinal column requires freedom of movement of the neural structures
- Forward flexion may be restricted by limited movement of neurological structures in the vertebral canal
- Movement tests that assess such structures without moving the spinal column are limited

Base Neurodynamic Tests

- Passive Neck flexion (PNF)
- Straight Leg Raise (SLR)
- Slump Test
- Prone Knee Bend (PKB)
- Upper Limb Tension Tests
  - ULTT1 (Median bias)
  - ULTT2a (Median bias)
  - ULTT2b (Radial bias)
  - ULTT3 (Ulnar bias)

Clinical Responses to Tests

- Normal physiological: SLR strain at B
- Clinical physiological: SLR pain at L
- Neurogenic … a positive tension test includes:
  - Reproduction of the Comparable Sign
  - Signs or Symptoms are altered by movement of distal parts
  - Contra-lateral side is different

Passive Neck Flexion

- Patient lies supine and therapist passively flexes the neck
- Changes in symptoms are noted
- PNF can be added to the SLR

The Straight Leg Raise Test

- Patient lies supine with legs relaxed.
- Therapist grasps the patient's heel and lifts the leg.
- Patient is passive throughout.
- The test is stopped once resistance is met or pain is elicited.

Straight Leg Raise Test

- Tests the free movement of the low lumbar and sacral nerves roots and their sleeves in the vertebral canal and IV foramina.
- Pain restriction at 40° indicates restriction from herniated disc.
- Addition of passive neck flexion or dorsiflexion can also be used.

Slump Test

- Testing the integrity of the dura connecting the spinal cord to the nerve sleeves of the lower limb nerves
- Gradual increases in stretching of the dura by altering the patient's body position may elicit pain
- Removal of particular aspects of the slump test may decrease symptoms and indicate the location of the damage

The Slump Test

- Patient sits with his hands behind his back, on the examination couch until the back of his knees contacts the couch.
- Patient reports any discomfort.
- Patients slumps his back through full range lumbar and thoracic flexion.
- Firm overpressure is applied at the shoulder region.

The Slump Test

- Once the hips are flexed to 90° the cervical spine is fully flexed.
- Any change in symptoms is noted.
- Over-pressure is applied to the back of the head so the whole spine is under a stretch.
- The patient is asked to extend the left knee and range and symptoms noted.
- Active dorsiflexion is added and response noted.

ULTT 1 – Median Nerve Bias

- Scapular depression – (hold scapula with one hand while performing motion of the arm with the other hand)
- Shoulder abduction (110°)
- Elbow extension
- Forearm supination
- Wrist and finger extension

- Sensitizer: cervical side flexion to the contra-lateral side

ULTT 2a – Median Nerve Bias

- Shoulder depression
- Shoulder abduction (10°)
- Forearm supination
- Wrist extension
- Finger and thumb extension
- Shoulder lateral rotation

- Sensitizer: cervical side flexion to the contra-lateral side

ULTT 2b – Radial Nerve Bias

- Shoulder depression
- Shoulder abduction (10°)
- Elbow extension
- Forearm pronation
- Wrist flexion and ulnar deviation
- Fingers and thumb flexion
- Shoulder medial rotation

- Sensitizer: cervical side flexion to the contra-lateral side

ULTT 3 – Ulnar Nerve Bias

- Shoulder depression
- Shoulder abduction (10° to 90° - hand to ear)
- Elbow flexion
- Forearm supination
- Wrist and finger extension and radial deviation
- Shoulder lateral rotation

- Sensitizer: cervical side flexion to the contra-lateral side

Any Questions?