Weakness overview

Distribution: reflects the site of lesion (e.g. proximal, distal, bilateral, unilateral, etc.)
Type: reflects the *element* of the nervous system that's impaired

To understand **nature** of **pathology** & **aetiology** of muscle **weakness**, what 4 things need to be considered?
1. Type of weakness
2. Distribution of weakness
3. Time course of onset
4. Mode of onset

Weakness vs. fatigue:
- *Weakness:* is regional
- *Fatigue:* is generalised

Pt records:
- Sense of clumsiness, tightness, instability
- Uncoordinated movement
- Numbness

Physical manifestations:
- Clumsiness
- Uncoordinated movement
- Loss of fine motor skills
- Imbalance

4 considerations of weakness:
- Type of weakness
- Distribution of weakness
- Time course of onset
- Mode of onset

Etiology

Introduction: Causes of weakness are categorised by lesion location. Some disorders have characteristic of lesions in more than one location. E.g. *Amyotrophic lateral sclerosis (ALS)* may have findings of both UMN & LMN dysfunction. Disorders of the SC may affect tracts from UMN, LMN (anterior horn cells), or both

Common causes of *focal* weakness
- Stroke: unilateral weakness
- Neuropathies: including trauma or entrapment caused (e.g. carpal tunnel syndrome) & that are immune-mediated (e.g. Bell palsy)

Etiology (cont)

***Temporary focal* weakness:**
- TIA (transient ischemic attack)
- Hypoglycaemia: with treatment hypoglycaemia & resulting weakness resolve

***Generalised* weakness:**
- Disuse atrophy: resulting from illness or frailty (specifically in older pts)
- Generalised muscle wasting: due to prolonged immobilisation in an intensive care unit (ICU) - aka *ICU myopathy*
- Critical illness polyneuropathy - aka *ICU neuropathy*
- Common myopathies: e.g. alcoholic myopathy, hypokalaemia, corticosteroid myopathy
- Use of paralytic drugs in critical care pts

Fatigue

Introduction: Many pts report weakness when they have fatigue. This can prevent maximal effort & muscle performance during strength testing

Common causes:
- Acute severe illness of almost any cause, **cancers**, **chronic infections** (e.g.HIV, hepatitis, endocarditis, mononucleosis), **endocrine disorders**, **renal failure**, **hepatic failure**, **heart failure**, & **anaemia**
- Multiple sclerosis can cause *daily fatigue* that increases with exposure to **heat & humidity**
- Pts with fibromyalgia, depression or chronic fatigue syndrome may report weakness or fatigue but have *no defined objective abnormalities*

Pathophysiology

Introduction: Voluntary movement initiated in cerebral cortex in the posterior aspect of the frontal lobe. Neurons involved - UMN or corticospinal tract nuerons - synapse with LMN in the spinal cord. LMN transmit impulses to the neuromuscular junction to initiate muscle contraction

Common mechanism of weakness include dysfunction of:
- **UMN:** corticospinal & corticobulbar tract lesions
- **LMN:** due to peripheral poly neuropathies or anterior horn cell lesions
- **Neuromuscular junction**
- **Muscle:** due to myopathies

Location correlates with physical findings:
- **UMNL:** disinhibits LMN → causing ↑ muscle tone (**spacticity**) & ↑ muscle stretch reflexes (**hyperreflexia**); Babinski reflex is specific for corticospinal tract dysfunction; UMNL can also ↓ tone & reflexes if motor paralysis is sudden & severe (e.g *spinal cord transections* → tone 1st ↓, then ↑ gradually over days/weeks) or if lesion damages the motor cortex of the precentral gyrus & not nearby motor associations
- **LMNL:** disrupts reflex arcs → causing hyporefelxia & ↑ muscle tone (**flaccidity**), & may cause fasciculations; with time, muscle atrophy
- **Peripheral polyneuropathies:** most noticeable in the longest nerves (i.e. weakness is prominent in the distal limb than the proximal & in legs more than arms) & produce signs of LMNL (e.g. ↓ reflexes & muscle tone)
- **Neuromuscular junction - myasthenia gravis:** (most common disorder) fluctuating weakness that worsens with activity & lessens with rest
- **Diffuse muscle dysfunction:** (myopathies) most noticeable in the largest muscle groups (proximal muscles)

Evaluation

Temporal pattern:

Anatomic pattern:

Physical examination:

Additional findings:

Key points

Distinguish loss of muscle strength from a feeling of fatigue

☐ If fatigue has **no anatomic or temporal pattern** of weakness in pts with a normal physical examination, suspect **chronic fatigue syndrome**, an as-yet undiscovered systemic illness **(e.g. severe anaemia, hypothyroidism, Addison disease)**, a psychologic problem **(e.g. depression)**, or an adverse drug effect

☐ If pts have **true muscle** weakness, first focus on determining whether weakness is caused by dysfunction of the **brain, spinal cord, plexuses, peripheral nerves, neuromuscular junction, or muscles**

☐ If pts have **hyperreflexia** & increased muscle tone **(spasticity)**, particularly if **Babinski reflex** is present, suspect an **UMN (corticospinal tract)** lesion in the **brain or spinal**: MRI is usually required

☐ If pts have **hyporeflexia**, **↓ tone**, **atrophy**, & **fasciculations**, suspect a **LMNL**

☐ If pts have **difficulty climbing stairs**, **combing hair**, & **standing up** with predominantly **proximal muscle weakness** & **intact sensation**, suspect **myopathy**