“NON-SURGICAL” NEUROLOGICAL PROBLEMS OF THE UPPER EXTREMITY
NEUROLOGICAL DISORDERS OF THE HAND

• Potentially “surgical”:
  – Compressive / entrapment neuropathies
  – Cervical radiculopathies

• “Non-surgical”
  – Non-compressive mononeuropathies and polyneuropathies, Brachial plexopathies, Neuronopathies, Upper motor neuron disorders and Central somatosensory disorders
Neurological Disorders of the Hand

Clinical Presentations

• Muscle weakness / atrophy
• Sensory disturbances
• Abnormal movements or posture
• Neuropathic joints
MUSCLE WEAKNESS

1. Is the weakness primary or secondary to painful conditions?

2. If primary, is it due to disorder of the motor unit or motor control?

3. If disorder of motor unit, where is the problem?
   Anterior horn cell / nerve root / plexus / peripheral nerve / muscle
### Muscle Weakness LMN vs UMN

<table>
<thead>
<tr>
<th></th>
<th>Motor unit Disorder (LMN)</th>
<th>Motor control Disorder (UMN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle atrophy</td>
<td>+++</td>
<td>+/-</td>
</tr>
<tr>
<td>Fasciculations / Fibrillations</td>
<td>+++</td>
<td>-</td>
</tr>
<tr>
<td>Muscle Tone</td>
<td>Decreased</td>
<td>Increased</td>
</tr>
<tr>
<td>Reflexes</td>
<td>Decreased</td>
<td>Increased</td>
</tr>
</tbody>
</table>
MUSCLE WEAKNESS
Where is the problem?

**Motor control Disorder**
- Corticospinal pathways
- Motor cortex
- Poor effort

Clinical Clues:
- Distribution of muscle weakness
- Type of weakness
- Distribution of Reflex changes

**Motor Unit Disorder**
- Ventral horn cells
- Root/Plexus/ Nerve
- NMJ/ Muscles

Clues to location:
- Distribution of weakness
- Distribution of sensory changes
- Distribution of reflex changes

**Imaging Studies**
- NCV & EMG Studies
Motor Unit Disorder

Root vs Nerve

• **C5 vs Axillary Nerve:**
  – Weakness involves **Deltoid, Spinati and Rhomboids**

• **C6 vs Musculocutaneous Nerve:**
  – Weakness involves **Biceps and Brachioradialis**

• **C7 vs Radial Nerve:**
  – Weakness involves **Triceps and Pronator teres**

• **C8-T1 vs Ulnar Nerve:**
  – Weakness involves **FDI, APB and EI**
SENSORY DISTURBANCE

- Is it in the distribution of?
  - Single nerve
  - Multiple nerves
  - Symmetric Peripheral neuropathy
  - Nerve root/roots
  - Central somatosensory pathways
  - Sensory cortex
Sensory Loss in Polyneuropathies

Peripheral polyneuropathy

Multimonomoneuropathy
SENSORY DISTURBANCE
Wasting of Intrinsic Hand Muscles

Peripheral Neuropathy
Median and ulnar nerve neuropathy
Medial cord / Lower trunk / C8-T1 Roots / Ventral horn cells at C8 & T1
Disuse atrophy
Distal myopathies
Polyneuropathies presenting with bilateral wasting and weakness of intrinsic hand muscles

• Hereditary Motor Sensory Neuropathy (HMSN)
  – HMSN I (Demyelinating)
  – HMSN II (Axonal)

• Acquired Neuropathies
  – Metabolic, Toxic, Paraneoplastic
  – Chronic inflammatory demyelinating polyneuropathy (CIDP)
  – Multifocal motor neuropathy with conduction block
Hereditary Motor Sensory Neuropathy
Charcot Marie Tooth Disease
Hereditary Motor Sensory Neuropathy

- Type 1: Marked slowing of motor conduction velocity
- Type 2: Motor conduction velocity almost normal; denervation changes in the muscles
- Hereditary neuropathy with tendency for pressure palsy presents with recurrent mononeuropathies
DIABETIC NEUROPATHY

Symmetrical Neuropathies
  Distal sensory and sensorimotor
    Small fiber
    Large fiber

Asymmetrical Neuropathies
  Mononeuropathy
  Multimonomoneuropathy
SYRINGOMYELIA

- Cavitation of the spinal cord
- Most common level:
  - Cervicothoracic
- May present with wasting of intrinsic hand muscles, painless ulcers in the fingers and neuropathic joints
- “Dissociated sensory loss” (loss of pain and temperature sensation with intact touch and position sense) is a typical feature
Syringomyelia
Syringomyelia

- Progression may be controlled by surgical intervention
  - Syringoperitoneal shunt
  - Ventriculoperitoneal shunt
  - Foramen magnum decompression
Amyotrophic Lateral Sclerosis (ALS)

*Simultaneous involvement* of the lower and the upper motor neuron is the hallmark

- Wasting and weakness of the intrinsic hand muscles may be the initial symptom
- Common to see *fasciculations*, wasting and *hypereflexia*
Amyotrophic Lateral Sclerosis (ALS)

- Tongue wasting and fasciculations
- Asymmetrical wasting of FDI and APB
- Split hand /dissociated wasting
BRACHIAL PLEXOPATHIES

- Acute brachial plexus neuropathy
- Post-median sternotomy brachial plexopathy
- *Radiation-induced brachial plexopathy*
Acute Brachial Plexus Neuropathy

- Synonyms:
  - Parsonage-Turner Syndrome, Neuralgic amyotrophy, Shoulder girdle neuropathy
- Immune-mediated nerve damage
- Acute or subacute onset with pain
- Severe pain abates with the onset of muscle weakness
Acute Brachial Plexus Neuroapathy

• Usually partial lesion of upper trunk, but the muscle weakness may be in the distribution of a single nerve such as long thoracic, suprascapular, axillary, radial, or anterior interosseous or multiple nerves.
• Antecedent events may be: immunization, URI, surgical procedure, or pregnancy
Parsonage Turner Syndrome
Acute Brachial Plexus Neuropathy

• Prognosis:
  – In a group of 99 patients, 36% recovered within 1 year
  – 75% recovered by the end of second year
  – 89% recovered by the end of third year.
  – In 5% of patients recurrent episodes may occur
Ischemic Monomelic Neuropathy

Typically seen after placement of AV shunts for dialysis in diabetic patients with renal failure
Severe burning pain and motor and sensory loss, most severe in the distal portion of the limb, affecting median, ulnar and radial nerves
Caused by ischemic infarction of the distal axons, caused by limb ischemia.
Motor Control Disorders

- Acute onset: May present with weakness and hypotonia initially: eg: Multiple sclerosis, Stroke, Todd’s (post-focal seizure) palsy
- Slow movements (bradykinesia) and rigidity in Parkinson’s disease
- Apraxia may lead to “useless” hand
- Dystonia and other movement disorders
Writer’s Cramp
(Task-specific Focal Dystonia)
Clenched Fist Syndrome
SUMMARY

• Many neurological disorders may present with signs and symptoms in the upper extremities. It is important to develop a clinical approach that can to a large extent differentiate those conditions needing surgical interventions from those that do not.