Clinical Approach to Neurologic Disorders

- **GENERAL SYMPTOMS AND SIGNS**
  - Anatomic
  - Pathophysiologic
  - Phenomenologic

- **TREATMENT**
  - Symptomatic
  - Protective
  - Curative
  - Surgical

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Surgical Approaches

- **Ablative**
  - Thalamotomy
  - Pallidotomy

- **Electrical stimulation (DBS)**
  - VIM thalamus, globus pallidus internus, sub-thalamic nucleus

- **Transplant**
  - Autologous adrenal, human fetal, xenotransplants, genetically engineered transplants

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Medtronic DBS system
### Disease Classification

- Congenital
- Genetic
- Demyelinating
- Vascular
- Immunologic
- Neoplastic/Paraneoplastic
- Toxic/Nutritional
- Metabolic
- Mitochondrial/Sub-cellular systems
- Infectious/Post-infectious
- Traumatic
- Degenerative
- Idiopathic
- Iatrogenic

### Physical Exam

**In neurology, asymmetric or focal findings are typically most important**

**General medical:**
- Brief comments on relevant pulmonary, cardiovascular (murmurs, bruits), muscle-skeletal (deformities, asymmetries) and skin (rashes, other markings).

**Neurologic:**

1. **Mental status:** orientation, level of alertness, speech, memory, cognitive state (mini-mental exam helpful).
2. **Cranial nerves:** I (if asymmetric or particularly with personality changes or suspected frontal lobe disease), II - fundus exam, visual acuity (should be documented), visual fields, and relative afferent pupillary defect (RAPD).
3. **III, IV, and VI:** pupillary and eye movements, optokinetic nystagmus (OKN), other forms of nystagmus and related findings.
4. **V sensory:** cornea, skin to vertex of head, not angle of mandible.
5. **Motor:** muscles of mastication (chewing).
6. **VII:** should clarify peripheral vs central issues.
7. **VIII:** important in hearing, balance.
8. **IX - XII:** speech quality, swallowing, tongue movements, tongue atrophy.
### Physical Exam

#### Motor exam
- **Strength** e.g. MRC 5/5 point scale
- **Muscle mass**
- **Tone**
- **Reflexes** deep tendon (can be elicited in the jaw) cutaneous (Babinski, abdominals)
- **Rapid alternating movements** speed, decrement rhythm
- **Involuntary movements**
  - tremor
  - myoclonus
  - chorea
  - athetosis
  - tics
  - dystonia
  - ballismus
  - dyskinesia
- **Motor apraxias** dressing, combing hair, brushing teeth

#### Sensory exam
- **Cranial divisions of V**
- **Other head and neck** Angle of jaw
- **Spinal levels** Nerve or root
- **Primary modalities**
  - Light touch
  - Two point discrimination
  - Pain
  - Vibration
  - Position sense
- **Higher cortical modalities**
  - Graphesthesia
  - Stereognosis

#### Coordination
- **Usually, but not always, tests for cerebellar dysfunction**
- **Targeted voluntary movements** finger-to-nose, heel-knee
- **Rapid alternating movements** fine hand, finger control

#### Gait and posture
- **Stride, stance**
  - trunk sway, arm swing
- **Posture**
  - stooped, falling forward, backward
- **Freezing**
  - in place
  - on or off medication
  - at start of walking
Disorders of muscle tone

I. HYPERTONICITY
   a. Upper motor neuron syndrome
      1. Loss of strength - paresis or paralysis
      2. Loss of fine distal movements
      3. Spasticity
         clasp-knife (velocity-dependent) tone
         increased (velocity-dependent) deep tendon reflexes
      4. Release of flexor reflex afferents, e.g. Babinski sign
   b. Extrapyramidal rigidity
      1. Plastic, lead-pipe, equally increased tone throughout
      2. Normal deep tendon reflexes
      3. No paralysis of movement

Disorders of muscle tone

II. HYTONICITY
   a. Cerebellar disease - acute
   b. Deep coma

III. GEGENHALTEN
   Resistance to passive manipulation, unable to relax, confusion,
   frontal lobe disease
   Basal ganglia disease

NEGATIVE symptoms
   a. Primary functional deficits -
      1. Akinesia or bradykinesia
      2. Loss of postural reflexes
      failure to make small adjustments walking, standing up, etc
      3. Difficulty with rapid alternating movements

POSITIVE symptoms
   b. Secondary effects -
      1. Lead pipe rigidity
      2. Involuntary movements (hyperkinetic disorders or dyskinesias)
         tremor
dystonia
chorea
athetosis
ballism
akathisia

Basal ganglia disease

Neg a tive symptoms

Positive symptoms
Basal Ganglia

- Subcortical forebrain structures connected to sensorimotor and limbic systems
- Crucial part of the “control circuitry” that allows for the smooth execution of voluntary movement

Basal Ganglia

- Multiple cortico-basal ganglia-thalamo-cortical circuits
- Help program and carry out motor plans
- Scale the amplitude and effort of the execution of tasks with relation to requirements
- Incorporate motivation and emotional drives

Normal vs Parkinson’s disease diagram.
Basal ganglia disease

Tremor

- Physiologic and exaggerated physiologic
- Rest (parkinsonian)
- Kinetic or action
- Postural
- Intention (cerebellar)
- Task-related: writing tremor, orthostatic tremor

Dystonia

- Sustained and/or semi-rhythmic muscle spasms, often worse with a particular task or posture
- Persistent attitude in extremes of position, e.g., hyper-flexed or hyper-extended
- Irregular tremors
- "Occupational" cramps (writer's cramps, musician's cramps, etc)
- Meige's syndrome: blepharospasm and orofacial dyskinesia/dystonia

Photo by James Parkinson from his paper "An Essay on the Shaking Palsy" 1817
Basal ganglia disease

- Chorea
- Athetosis
- Ballism

Basal ganglia disease

- Myoclonus
- Tics
- Akathisia

Neurologic Issues Relevant to Dentistry

- Bell’s palsy
Bell’s palsy

Initial presentation  After 6 months

Neurologic Issues Relevant to Dentistry

Disorders affecting the face, jaw, mouth and neck

- Trigeminal neuralgia
- Temporo-mandibular joint disorders
- Other facial pains
- Jaw tremors
- Bruxism
- Tardive dyskinesia
- Meige’s syndrome
- Other oro-buccal facial dystonias
- Torticollis

Other Neurologic Issues Relevant to Dentistry

Complications of anesthesia
Malignant Hyperthermia

Sudden onset of high fever, muscle rigidity and autonomic signs.

- Temperature rise → 42-43°C
- Tachypnea, tachycardia
- Loss of brainstem reflexes
- Circulatory collapse
- Rigidity in all muscles → high CK and myoglobinuria
- Jaw clenching - unexpected after relaxation from anesthesia

Anesthetic agents: halothane, succinylcholine, ether

Malignant Hyperthermia

Pathogenesis:
- Anesthesia leads to increase in O2 consumption
- Depletion of ATP
- Muscles unable to relax (muscles require energy to relax)

Treatment:
- Discontinue anesthesia at first sign
- IV dantrolene - inhibits Ca++ release
- Cooling, hydration, sodium bicarbonate

Susceptible patients:
- Family history of anesthetic-related problems
- Musculoskeletal abnormalities
- Short stature, ptosis, high arched palate