Motor pathway
*(Corticospinal tract)*

Upper motor neuron

Lower motor neuron
UPPER MOTOR NEURON LESION

CORTICOSPINAL TRACT

CORTEX

INT. CAPSULE

BRAIN STEM

MOTOR DECUSSIONATION

SPINAL CORD
SPINOThALAMIC TRACT
UPPER MOTOR NEURON LESION

CORTICOSPINAL TRACT

CORTEX

INT. CAPSULE

BRAIN STEM

MOTOR DECUSSSION

SPINAL CORD

SPINOPTHALAMIC TRACT
FACIAL PALSY

UPPER MOTOR NEURON:
contralateral facial palsy below upper eyelid

LOWER MOTOR NEURON:
ipsilateral facial palsy

III. Closing eyes
Patient can close both eyes
Right eye does not close and eyeball turns up (Bell's phenomenon)
HEMISPHERIC LESION

CORTICAL *and* SUBCORTICAL

**MOTOR**: contralateral hemiparesis UMN type

**FACE**: contralateral UMN type facial palsy

**SENSORY**: contralateral hemianesthesia
EPISODE I
CORTICAL SIGNS
CORTICAL SIGNS AND BRAIN STEM
CORTICAL vs SUBCORTICAL

CORTICAL SIGNS
PATTERN of WEAKNESS
CONSCIOUSNESS
EYE DEVIATION
DOMINANT HEMISPHERE

- Right handed: Left (95%) >>> Right
- Left handed: Left (60%), Right (40%)
- Language: aphasia
- Learn motor skills: apraxia
CORTICAL LESION: NON DOMINANT

- Rhythm and music
  - Amusia, loss of prosody, monotonal voice
- Visuospatial analysis
  - Dressing and Constructional apraxia
- Attention deficit
  - Neglect
CORTICAL LESION: NON DOMINANT

DRESSING APRAXIA
- Not true apraxia (bad term)
- Disorder of visuo-spatial perception that difficulty dressing
- Lesion at right parietal lobe

CONSTRUCTIONAL APRAXIA
- Disorder of visuospatial perception
- Inability to copy or construct complex figure
- Test by ask patient to copy a complex figure
- Lesion at right parietal lobe
CORTICAL SIGNS

DOMINANT PARIETAL LOBE
aphasia, apraxia, Gerstman’s syndrome:
*(left-right confusion, acalculia, finger agnosia, agraphia)*

NON DOMINANT PARIETAL LOBE
impaired 2-point discrimination, sensory inattention, astereognosia, agraphesthesia, sensory extinction
dressing apraxia, constructional apraxia, neglect
Pattern of weakness:
face, arm > leg

Consciousness:
impair if face, arm, leg involved

Eye deviation: *(Frontal eye field, AREA 8)*
deviate to lesion

Seizures:
suggest cortical
Absent of specific cortical deficits:
Pattern of weakness:
  face, arm = leg
Consciousness:
  no impair though face, arm, leg involved
Eye deviation: *(Frontal eye field, AREA 8)*
  no eye deviate
Involuntary movement:
  parkinsonism, chorea, dystonia, hemiballism
BRAIN STEM

Cranial nerves abnormalities

**Mid brain**: diplopia
**Pons**: decrease facial sensation, facial palsy, vertigo, deafness
**Medulla**: dysarthria, dysphagia

Long tract findings:
- hemiparesis, hemianesthesia (contralateral)
- Horner’s, cerebellar sign (ipsilateral)
MEDULLARY SYNDROME

Diagram illustrating various brainstem structures, including:
- 12th N. nucleus
- Medial longitudinal fasciculus
- Tractus solitarius with nucleus
- Vestibular nucleus
- Restiform body
- Nucleus ambiguus (motor 9 + 10)
- Olivocerebellar fibers
- Descending nucleus and tract - 5th N.
- Medial lemniscus
- Descending sympathetic tract
- Dorsal spinocerebellar tract
- 10th N.
- Ventral spinocerebellar tract
- Inferior olive
- Spinothalamic tract
- Medullary syndrome: Lateral and Medial
LATERAL MEDULLARY SYNDROME

posterior inferior cerebella artery (PICA)

Ipsilateral

Impair sensation of face
Ataxia of limb, nystagmus, nausea, vertigo
Horner’s syndrome
Dysphagia, hoarseness, vocal cord paralysis

Contralateral

Sensory loss of arm and leg spare face
MEDIAL MEDULLARY SYNDROME

penetrating branch of vertebral or lower basilar artery

Ipsilateral

- Paralysis and atrophy of tongue
- Ataxia of limb, nystagmus, nausea, vertigo

Contralateral

- Paralysis of arm and leg spare face
PONTINE SYNDROME

Diagram showing anatomical structures related to pontine syndrome, including the medial longitudinal fasciculus, 6th N. nucleus complex, vestibular nucleus, restiform body, 7th N. nucleus, dorsal cochlear nucleus, descending tract and nucleus of 5th N., 8th N., 7th N., spinothalamic tract, middle cerebellar peduncle, medial lemniscus, pontine nuclei and pontocerebellar fibers, corticospinal and corticobulbar tract.
LATERAL PONTINE SYNDROME

anterior inferior cerebella artery (AICA)

Ipsilateral
- Impair sensation of face
- Ataxia of limb, nystagmus, nausea, vertigo
- Horner’s syndrome
- Facial palsy LMN type
- Deafness or tinnitus

Contralateral
- Sensory loss of arm and leg spare face
MEDIAL PONTINE SYNDROME

penetrating branch of basilar artery

**Ipsilateral**
- Diplopia in lateral gaze
- Ataxia of limb, nystagmus, nausea, vertigo

**Contralateral**
- Paralysis of arm and leg spare face
MIDBRAIN SYNDROME
LATERAL MIDBRAIN SYNDROME

superior cerebella artery (SCA)

Ipsilateral
Ataxia of limb, nystagmus, nausea, vertigo
Horner’s syndrome

Contralateral
Sensory loss of arm, leg and face
MEDIAL MIDBRAIN SYNDROME
penetrating branch of basilar artery

Weber’s syndrome: lesion at cerebral peduncle
CN III palsy + contralateral hemiparesis (include face)

Benedikt’s syndrome: lesion at red nucleus
CN III palsy + contralateral abnormal movement

Nothnagel’s syndrome: lesion at superior cerebellar peduncle
CN III palsy + ipsilateral cerebellar ataxia

Claude’s syndrome: all syndrome
Circumferential branch: PICA, AICA, SCA
Penetrating branch
BRAIN STEM

TRACT
Corticospinal
Cerebella
Spinothalamic
Spinal tract of CN V
Sympathetic pathway (Horner’s Syndrome)

CRANIAL NERVE
Midbrain: CN III, IV
Pons: CN V, VI, VII, VIII
Medulla: CN IX, X, XI, XII
Abnormal sensation at contralateral side
SPINAL TRACT of CN V

Abnormal facial sensation at ipsilateral
Horner’s syndrome at Ipsilateral

M = Meiosis
E = Enophthalmos
A = Anhydrosis
T = pTosis
Cerebella sign at Ipsilateral

ataxia
FNF
Heel to Knee
RAM
Scanning speech