Imaging the Brain Stem & Cranial Nerves

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Brain Stem Nuclei

Sensory

Motor

Netter, CIBA Collection, 1972
Brainstem Nuclei

Dorsal View

Blue = Sensory

Red = Motor

Netter, CIBA Collection, 1972
Midbrain

Superior Colliculus

Cranial nerve III
Corticospinal tracts
Substantia nigra
Reticular formation
Red nucleus
Medial lemniscus
Medial longitudinal fasciculus
3rd nerve nucleus
Superior colliculus
Periaqueductal gray

Ann Hayman, Brain Stem Charts
History: 1 y/o girl with spasticity & disconjugate gaze

Dx:
History: 48 y/o woman with dysarthria, diplopia, & right sided weakness
Dx: B-cell lymphoma pelvis & brain stem
History: 37 y.o. HIV+ male with a left 3rd nerve palsy
History: 20 y/o male with a right 3rd nerve palsy
Dx: 3rd nerve schwannoma
AIDS - CMV Neuropathy
Sarcoidosis
History: A 3rd nerve palsy with dilated pupil
Dx: p-Comm aneurysm
Brain Stem Anatomy

Oculomotor Nerve

Ophthalmoplegia
Dx: Meningioma - Cavernous sinus
Brain Stem Anatomy

Trochlear Nerve

- Internal carotid artery
- Post. communicating artery
- Post. cerebral artery
- Sup. cerebellar artery
- Basilar artery
- 6th Nerve
- Cavernous sinus
- 3rd Nerve
- 4th Nerve
- Trochlear nucleus

History: 22 y/o retarded female with double vision

Dx: MELAS - myopathy, encephalopathy, lactic acidosis & stroke-like episodes
History: 63 y/o man with seizures for 8 years & intermittent diplopia
Dx: Epidermoid

Diffusion
Upper Pons

- Cranial nerve V
- Corticospinal tracts
- Medial lemniscus
- Middle cerebellar peduncle
- 5th Nerve Nuclei
- Superior cerebellar peduncle
- Medial longitudinal fasciculus

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Trigeminal Nerve
History: 35 y/o man with bilateral facial pain
History: 73 y/o woman with weakness
Dx: Acute pontine infarct
History: 53 y/o man admitted with liver failure & hyponatremia
History: 38 y/o male with right facial numbness
Dx: Schwannoma
Lung Carcinoma
Metastasis to Meckel's Cave
History: 32 y/o male with diplopia, right facial pain & numbness
Dx: Non-Hodgkin's lymphoma
Trigeminal Neuralgia
Lower Pons

- Cranial nerve VI
- Corticospinal tracts
- Medial lemniscus
- Cranial nerve VII
- Cranial nerve VIII
- Salivatory nuclei
- 7th nerve nucleus
- 6th nerve nucleus
- Cochlear nucleus
- Vestibular nucleus
- Medial longitudinal fasciculus
- Pontine reticular formation

Ann Hayman, Brain Stem Charts
Brain Stem Anatomy

Abducens Nerve

History: 26 y/o man with bilateral 6th nerve palsies
Dx: Multiple hemorrhagic contusions - MLF

Trauma - MVA
Dx: NF 2 with CN schwannomas
History: 46 y/o man with 6th nerve palsy following trauma
Dx: Meningioma
History: 39 woman with SLE on chronic immunosuppression with steroids & methotrexate
History: 35-year-old male with diplopia on right lateral gaze
Dx: Intracavernous aneurysm
Cavernous Sinus

Cavernous Sinus

History: 9 y.o. girl with multiple bilateral cranial nerve palsies
History: 50 y/o woman with headaches & visual changes

Dx:
History: 59 y/o man presented in diabetic ketoacidosis with swollen right eye, unresponsive to antibiotics. Now blind in right eye & unable to open eye.
Dx: Rhinocerebral mucormycosis & cavernous sinus thrombosis

8 days later
History: 71 y/o woman with left facial swelling & increased tearing for 6 months
Dx: Lymphoma responded to prednisone.
History: 65 y/o female presented with trigeminal neuralgia & facial numbness
Dx: SCCA maxillary sinus
Normal Cranial Nerves
{CISS-3D}
History: 58 y/o man with a right 7th nerve palsy & hearing loss
Dx: 7th nerve schwannoma
History: 56 y/o female with left hemifacial spasm
Dx: Tortuous VB arteries
History: 81 y/o woman with chronic lymphocytic leukemia and a right 7th nerve palsy

Dx:
History: 47 y/o male with headache, dizziness & bilateral hearing loss
Dx: Superficial siderosis – chronic cocaine abuse but none recently.
History: 47 y.o. female with unilateral sensorineural hearing loss
Dx: Acoustic neurinoma
History: 55 y/o woman with acute hearing loss in the right ear 10 day ago

Dx:
History: 26 y/o man with nystagmus
History: 42 man with a right 7th nerve palsy & vertigo
Upper Medulla

- Corticospinal tracts
- Olivary nucleus
- Medial lemniscus
- Cranial nerve IX
- Cranial nerve X
- Nucleus ambiguous
- Inferior cerebellar peduncle
- Solitary nucleus
- Dorsal motor nucleus (X)
- 12th nerve nucleus
- Cranial nerve XII

Ann Hayman, Brain Stem Charts
Normal Cranial Nerves
{CISS-3D}
Medullary reticular formation

Spinotrigeminal nucleus

Cuneate nuclei and fasciculus

Gracile nucleus and fasciculus

Corticospinal tracts

Cranial nerve XII

Medial lemniscal decussation

Medullary reticular formation

12th nerve nucleus

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Pyramidal Decussation

- Corticospinal tracts
- Pyramidal decussation
- 11th nerve nucleus
- Lateral corticospinal tract
- Cranial nerve XI
- Spinotrigeminal nucleus
- Cuneate nuclei and fasciculus
- Gracile nucleus and fasciculus

Ann Hayman, Brain Stem Charts
History: 40 y.o. female with decreased left upper gaze and multiple lower cranial nerve palsies

Dx: En plaque meningioma
History: 60 y/o man with polycystic kidney disease, tinnitus, hoarseness & paretic right vocal cord
Tinnitus & hoarseness
{Page 3}

Dx:
History: 51 y/o male with paralysis of the right vocal cord
Dx: Arachnoid cyst
Sarcoid
History: 34 y/o male with lump in neck
Dx: 11th nerve schwannoma
CMV Cranial Neuropathy