

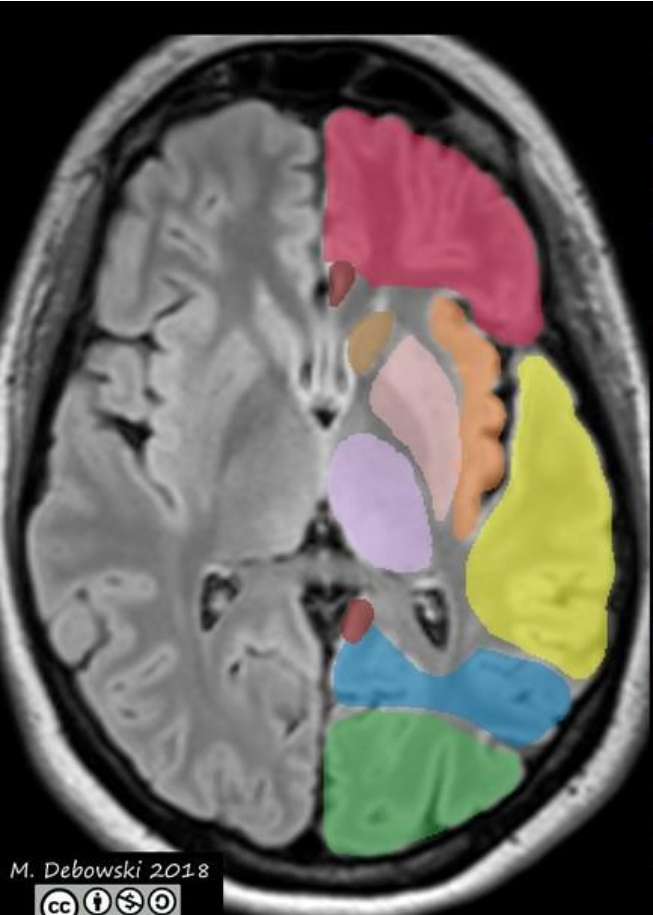
Thalamic Strokes

Ayşe Karaca, M.D.

Introduction

- Anatomy of the Brain and Thalamus
- Vascular Territories of the Thalamus
- Thalamic Nuclei
- Thalamic Fiber Systems
- Risk Factors
- Causes of Thalamic Strokes
- Types of Thalamic Strokes
- Diagnosis
- Thalamic Syndromes
- Differential Diagnosis
- Prognosis

Anatomy of the Brain and Thalamus

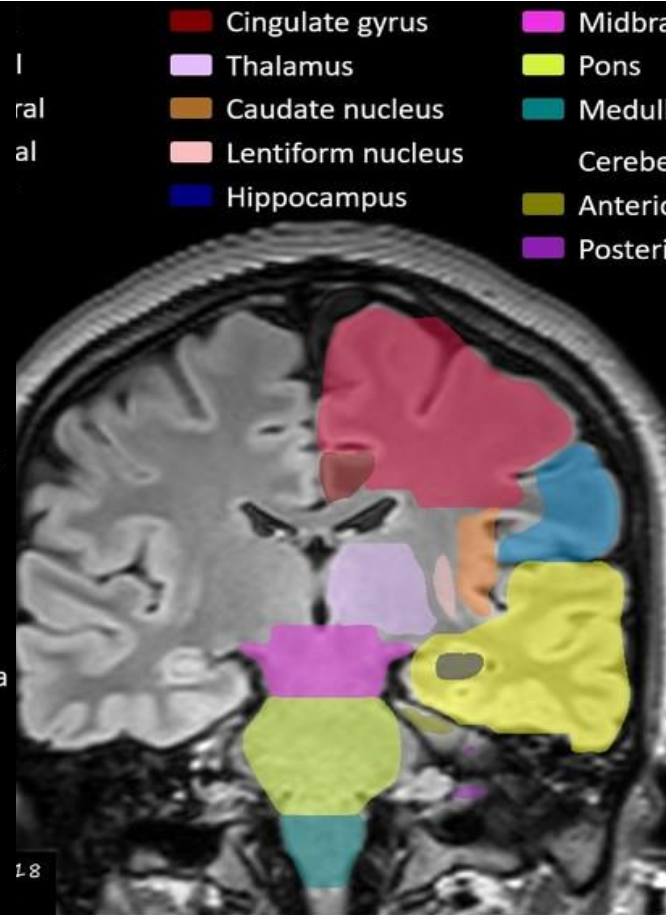


- Frontal
- Parietal
- Temporal
- Occipital
- Insular

- Cingulate gyrus
- Thalamus
- Caudate nucleus
- Lentiform nucleus
- Hippocampus

- Midbrain
- Pons
- Medulla oblongata

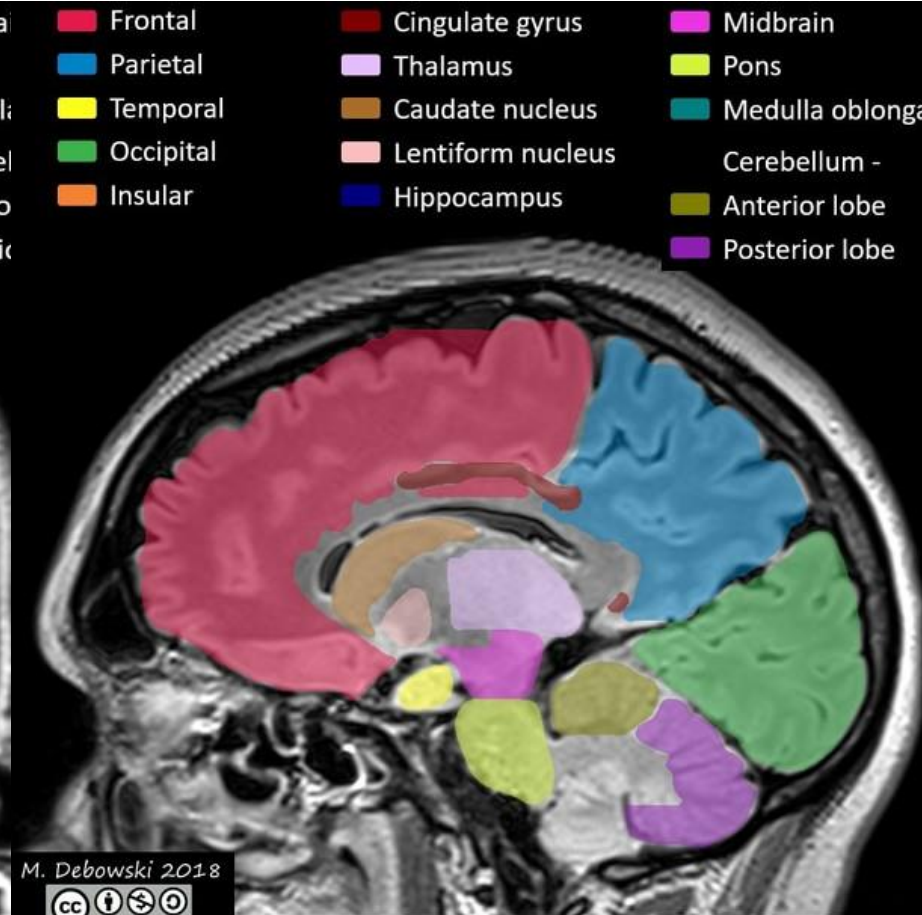
- Cerebellum -
- Anterior lobe
- Posterior lobe



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M. Deowski 2018



- anterolateral
- anteromedian
- inferomedial
- central
- inferolateral
- posterior
- posterolateral

Vascular Territories of The Thalamus

Territories:

Anterior territory-Tuberothalamic Artery

Anterior, ventral nucleus

Inferolateral territory: Thalamogeniculate Artery

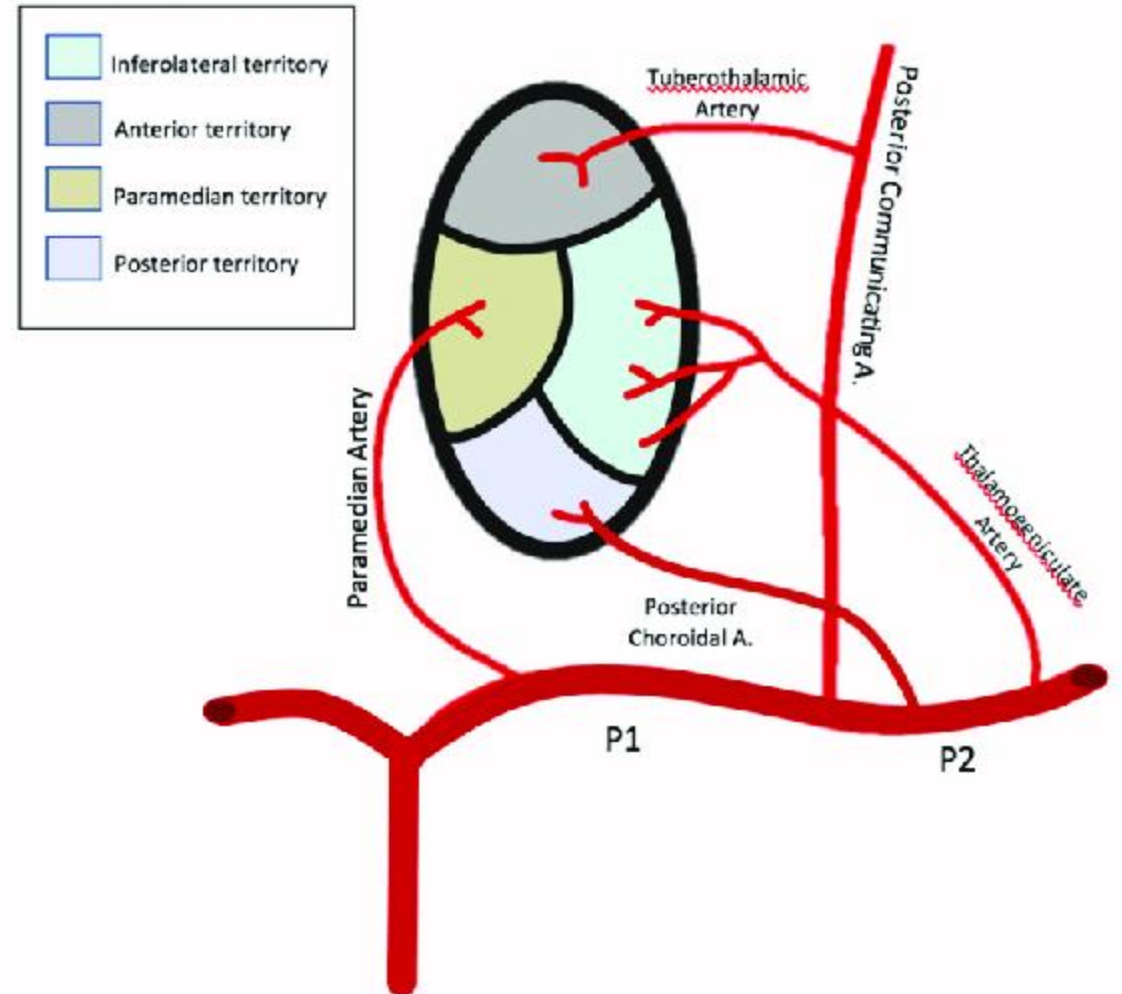
Ventral, MGL

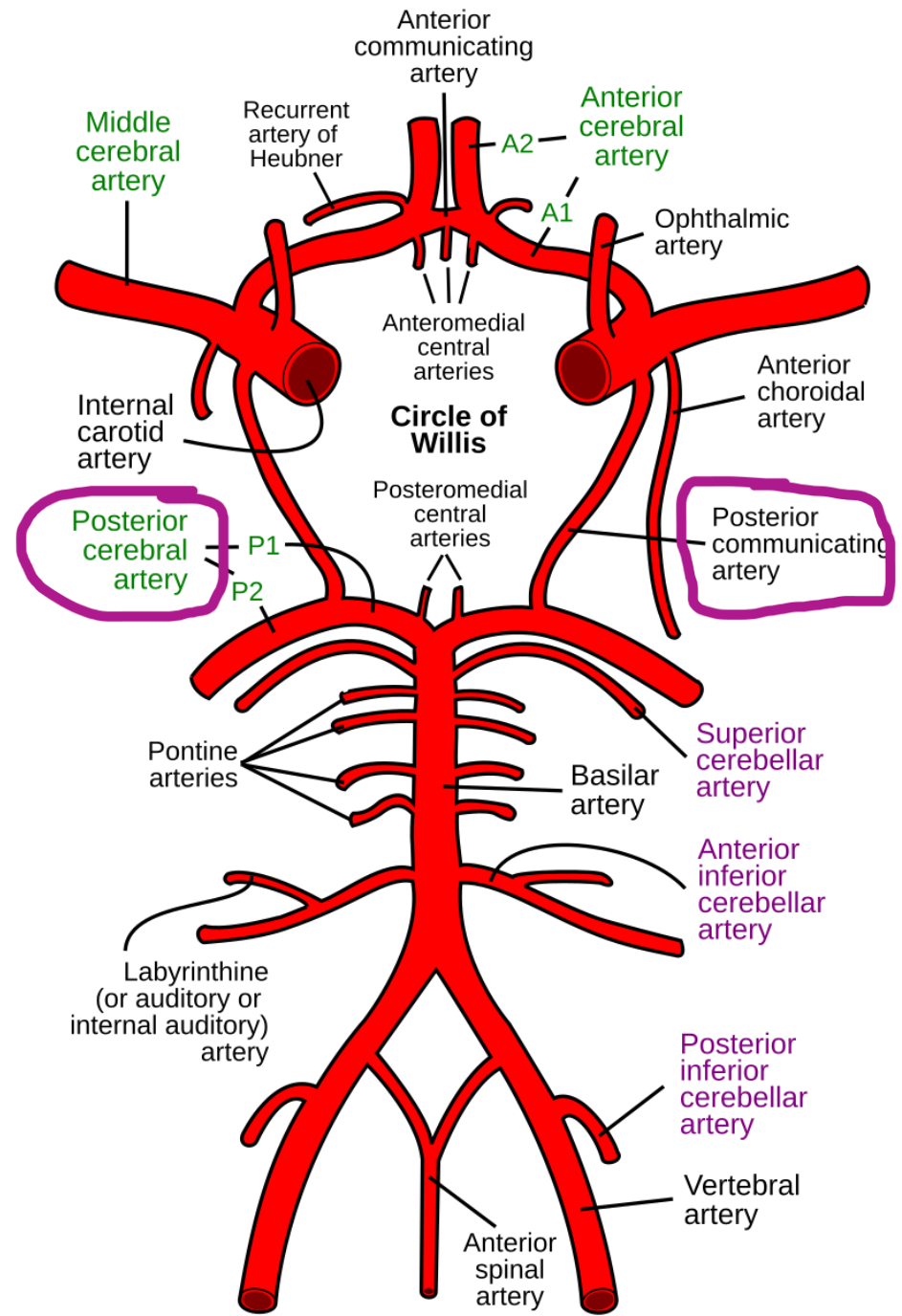
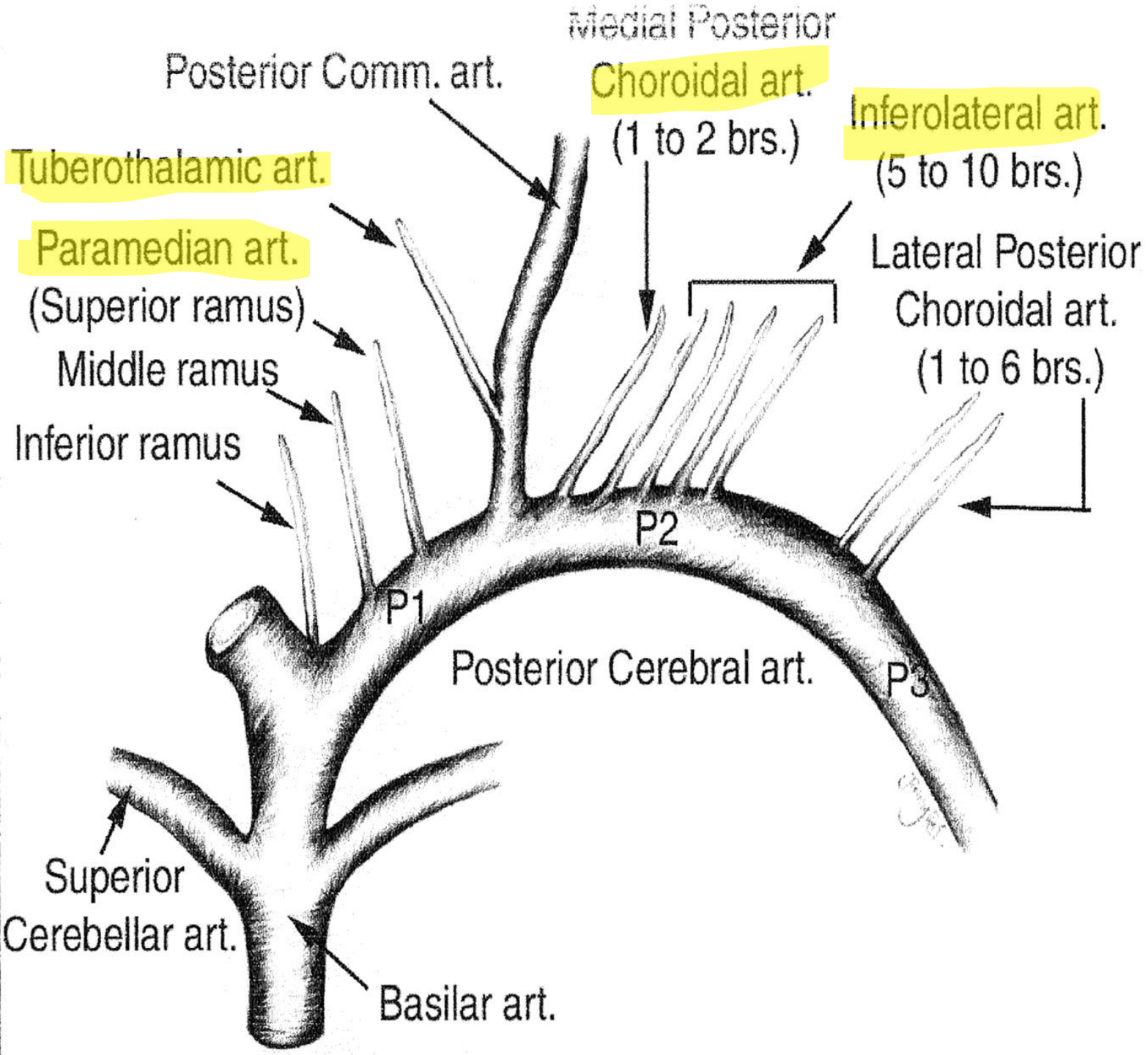
Posterior Territory: Posterior Choroidal Artery

Intralaminar, MGL, LGN, Pulvinar

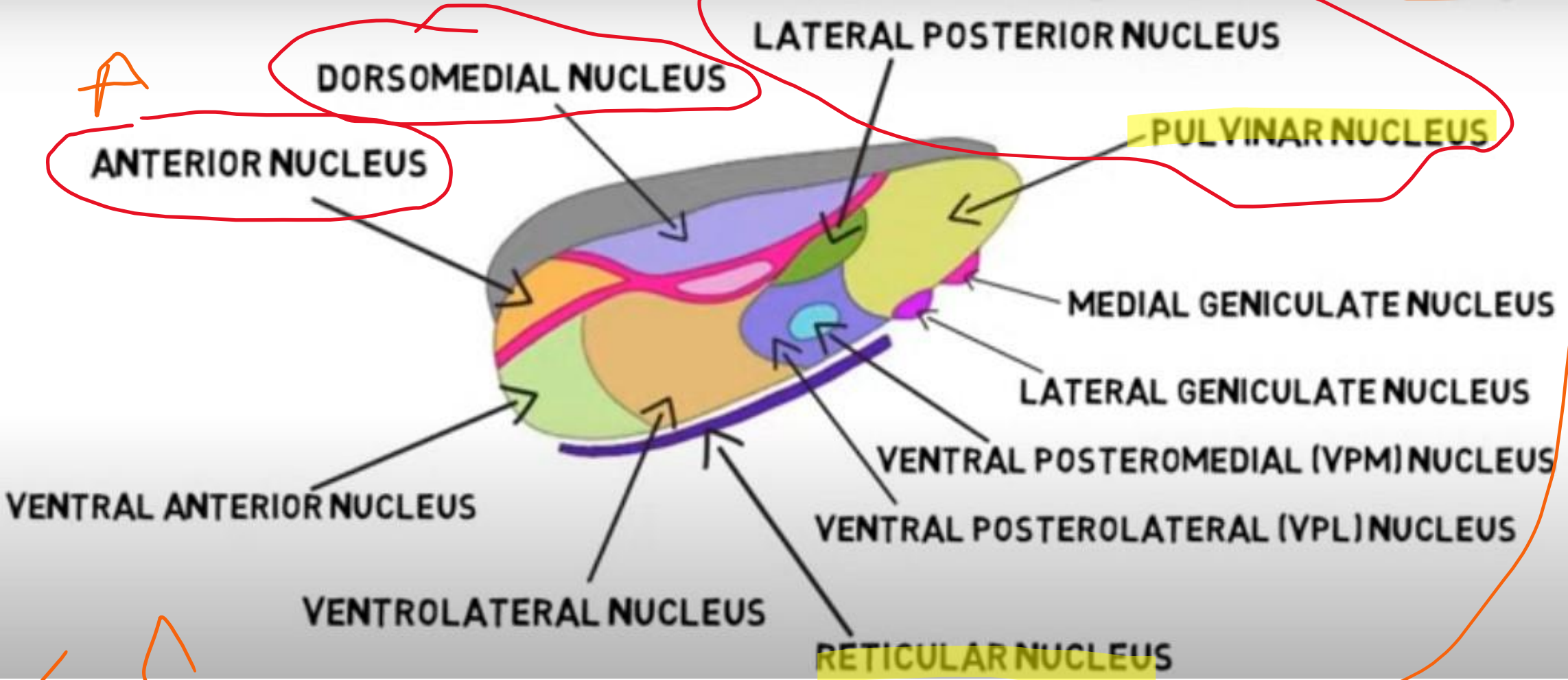
Paramedian Territory-Paramedian Artery

Medial





Nucleus of the Thalamus



Nucleus of The Thalamus

- Anterior Nucleus: Memory, learning, emotional regulation (AD,AV,AM)
- Lateral Dorsal Nucleus: Spatial learning
- Lateral Posterior Nucleus: Processing sensory information
- Ventral Anterior Nucleus: Planning of movement
- Ventral Lateral Nucleus: Coordination of movement
- Ventral Posterolateral Nucleus: Proprioception, crude touch, pain, temperature (VPL)
- Ventral Posteromedial Nucleus: (VPM) Taste, facial sensation.

Nucleus of The Thalamus

- Dorsomedial Nucleus: Emotion, cognition and memory processing
- Intralaminar Thalamic Nuclei: Awareness, arousal, motivation, pain, motor control
- Lateral Geniculate Nucleus: Visual processing
- Medial Geniculate Nucleus: Auditory processing
- Pulvinar Nucleus: Visual processing, attention, and integration of sensory information, auditory information, coordination of eye movements
- Reticular Nuclei: Arousal, sleep-wake cycle, rhythmic brain activities

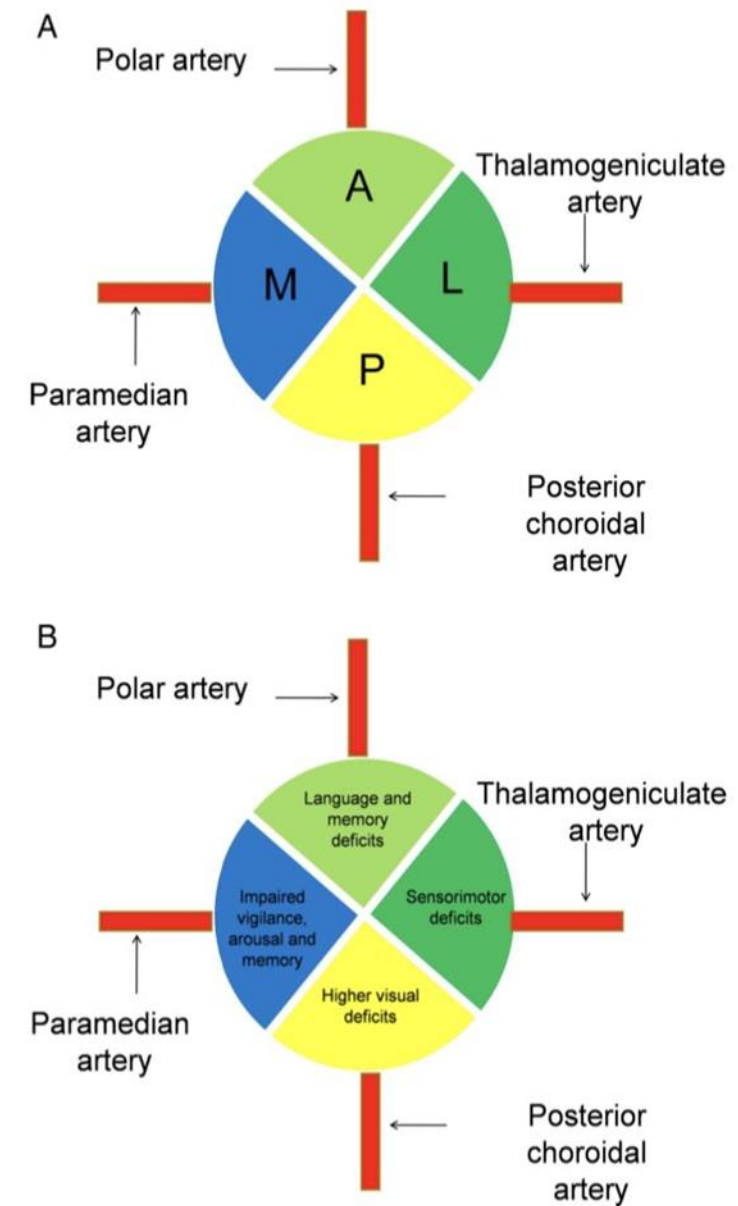
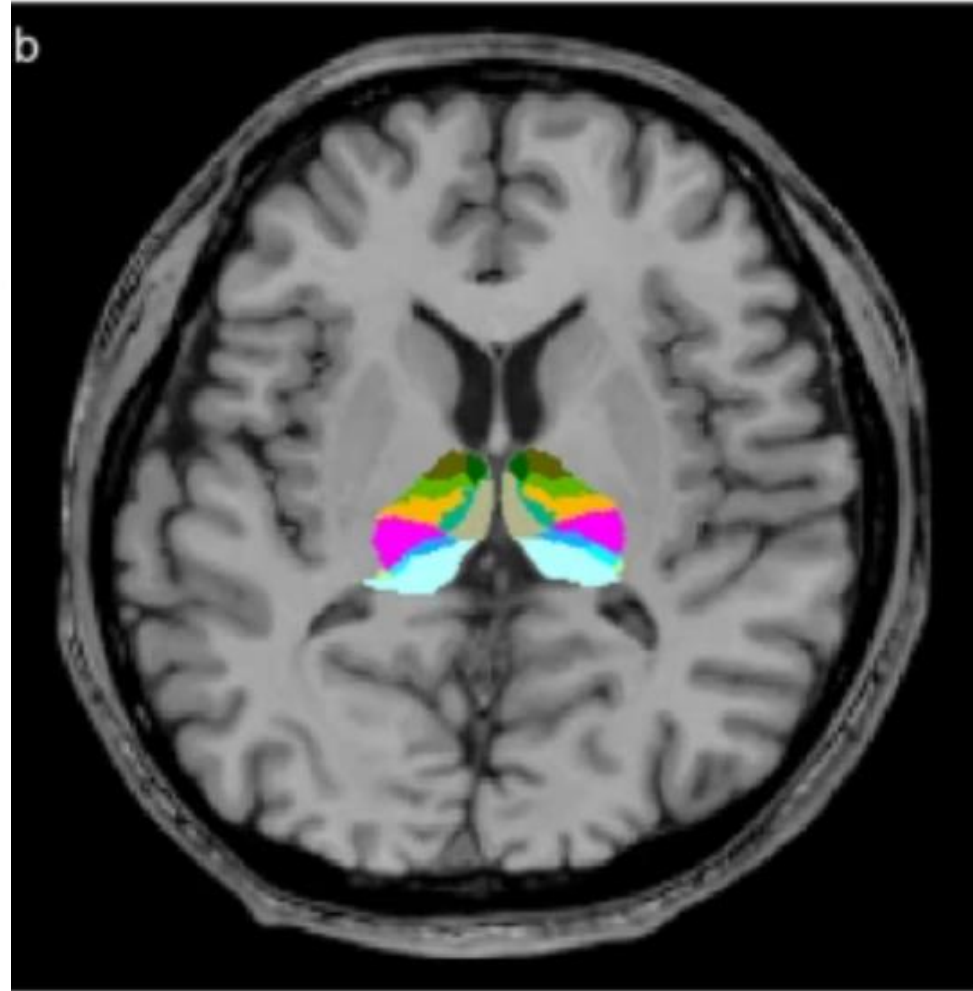
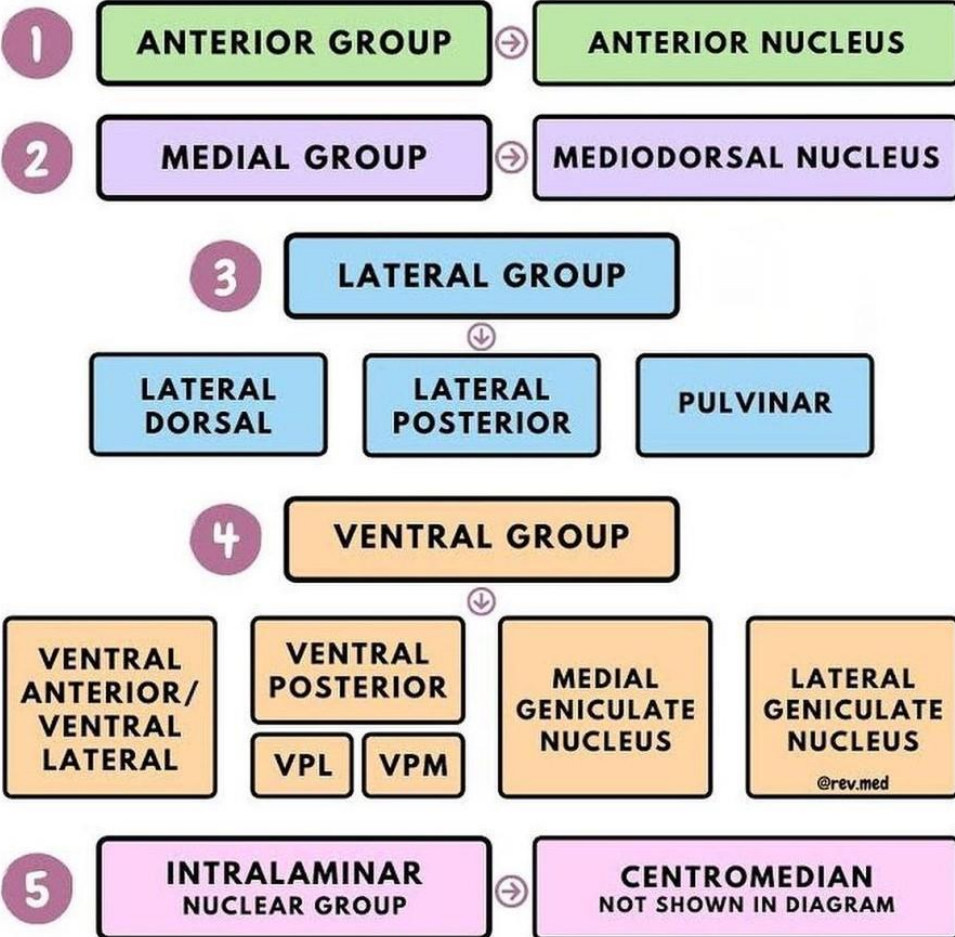


Figure 2 (A) Schematic view of thalamic blood supply and four functional regions. M, medial thalamic nuclei; A, anterior thalamic nuclei; L, lateral thalamic nuclei; P, posterior/pulvinar thalamic nuclei. (B) Schematic view of thalamic blood supply and typical deficits encountered following infarction of each region.

Thalamus Nuclei

THE FIVE NUCLEAR GROUPS



- Anteroventral
- Laterodorsal
- MDI
- MDm
- Pulvinar anterior
- Pulvinar lateral
- Pulvinar medial
- VA
- VLa
- VLp
- VPL
- Centromedian
- Lateral Posterior
- Medial Ventral

Thalamic Fiber Systems

- **The mamillothalamic tract:** LEARNING, MEMORY
- **The ventral amygdalofugal pathway:** MEMORY, EMOTIONAL REGULATION, AUTONOMIC FUNCTIONS, BEHAVIORAL RESPONSE
- **The corticothalamic pathway:** modulating sensory information, feedback loops

Thalamic Strokes

Tuberothalamic artery

•Neuropsychological deficits:

- Fluctuating level of consciousness.
- Disorientation to time and place.
- Apathy, abulia.
- Perseveration.
- Anterograde, autobiographic memory loss.

- Left-sided lesion: language deficit, acalculia.
- Right-sided lesion: hemispacial neglect.

Paramedian artery

•Neuropsychological deficits:

- Decreased arousal.
- Coma if bilateral (Artery of Percheron Infarction).
- Poor memory with confabulation
- Agitation, aggression, apathy
- Chronotaxis

- Left-sided: aphasia.
- Right-sided: hemineglect and spacial deficits.

Inferolateral artery

- Pure sensory loss.
- Hemiparesis.
- Hemiataxia.

- Déjerine-Roussy syndrome (thalamic pain syndrome); predominantly right-sided stroke.

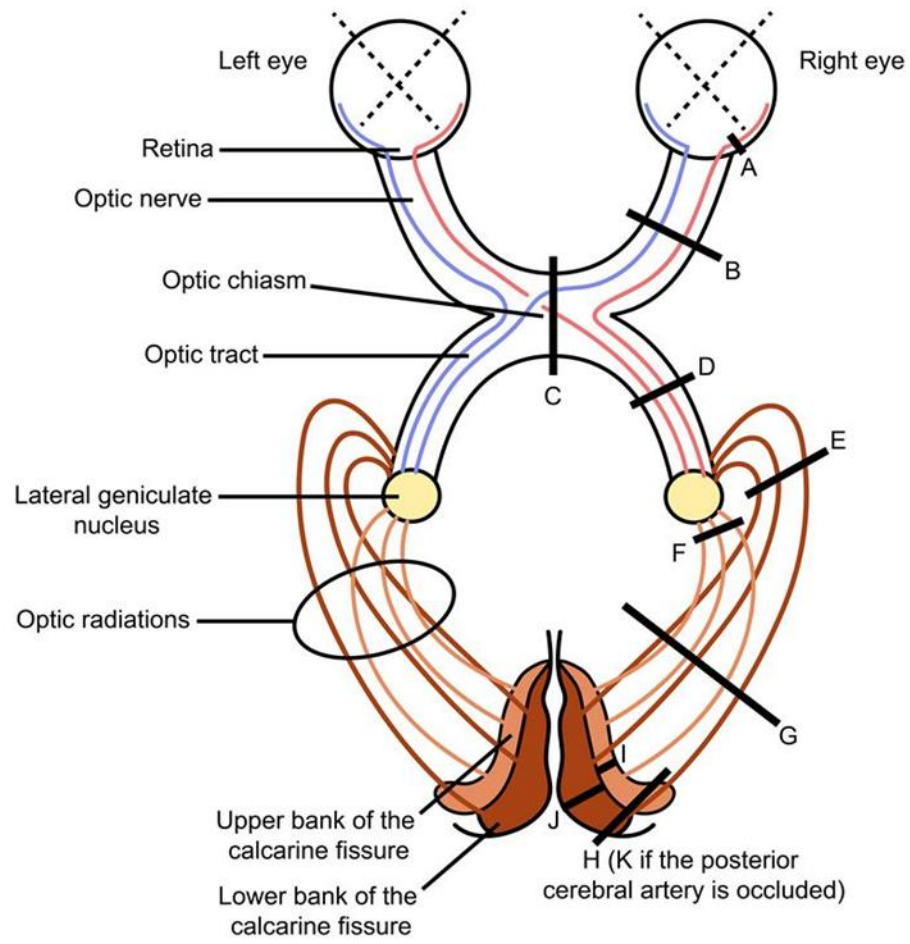
Hearing deficits.

Posterior choroidal artery

Variable sensorimotor deficits.
Rubral tremor.

Visual field loss.

Visual Field Defects



	Visual field deficit	
A) Central scotoma		
B) Monocular vision loss		
C) Bitemporal hemianopia		
D, G, & H) Contralateral homonymous hemianopia		
E & J) Contralateral superior quadrantanopia		
F & I) Contralateral inferior quadrantanopia		
K) Contralateral homonymous hemianopia with macular sparing		

Risk Factors

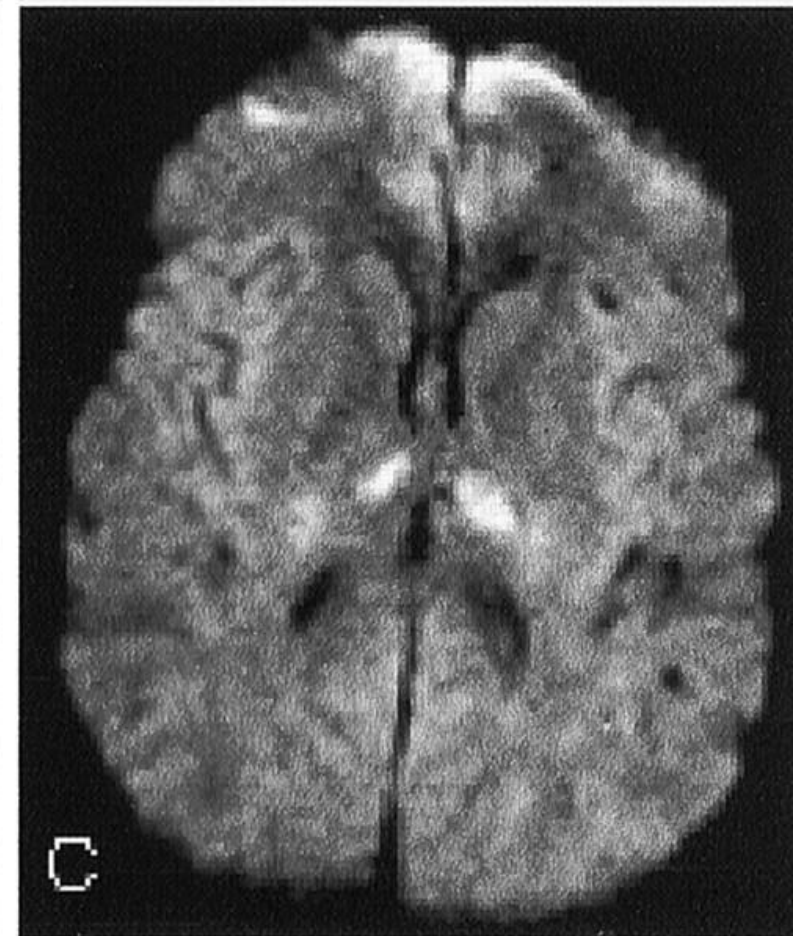
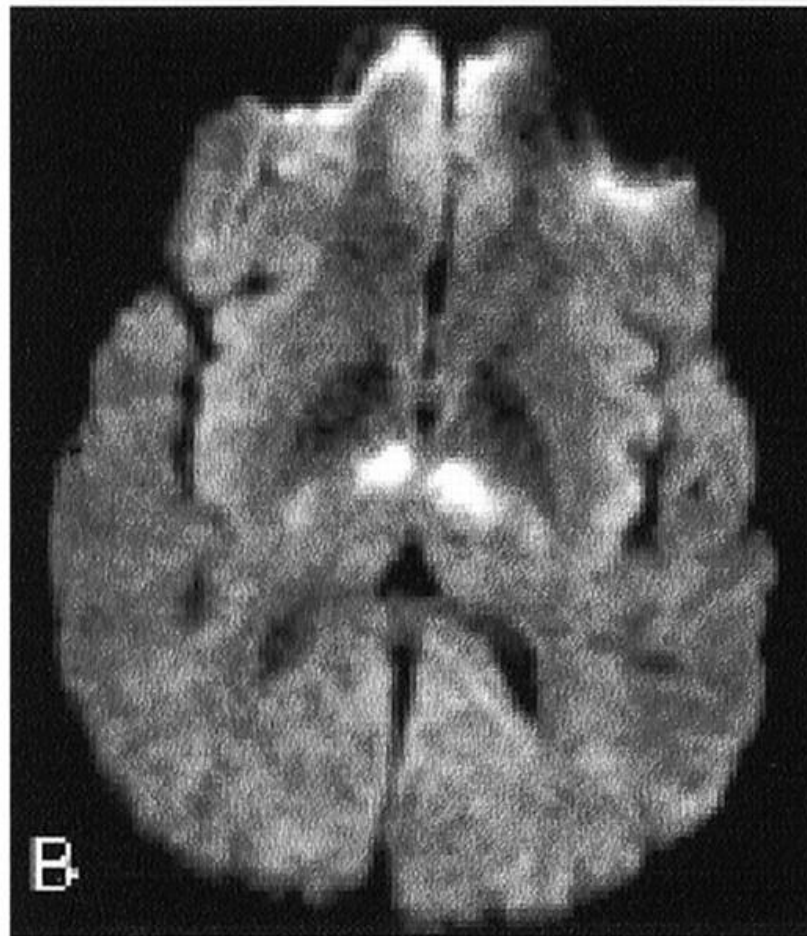
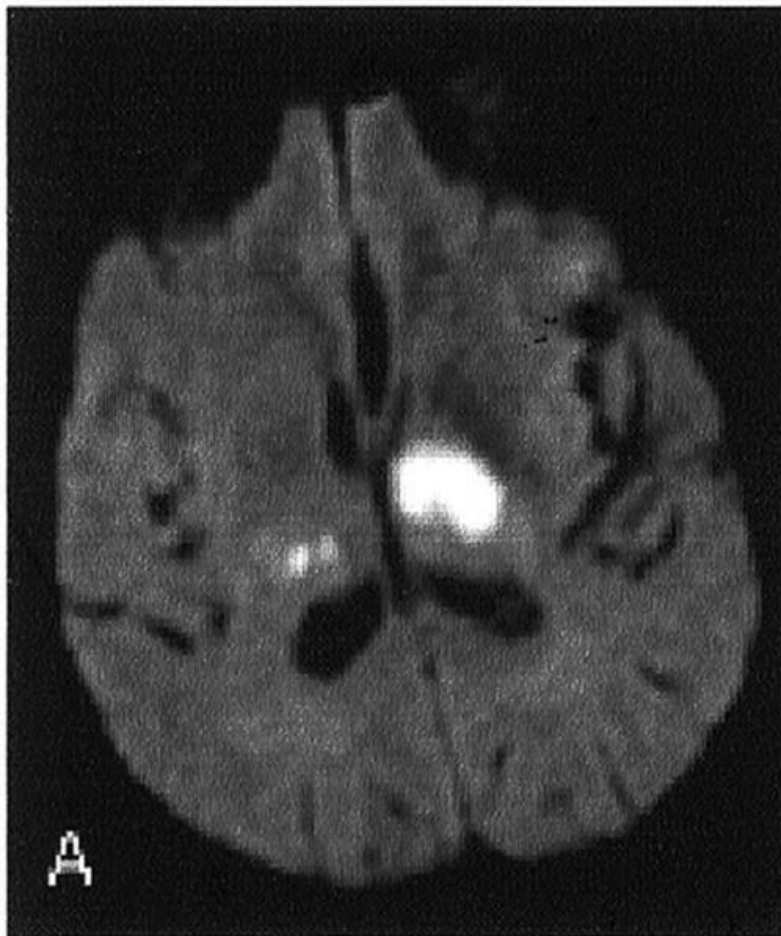
- Age
- Male sex
- Hypertension
- Diabetes mellitus
- Hypercholesterolemia
- Cigarette smoking
- Atrial fibrillation

The potential causes of thalamic strokes

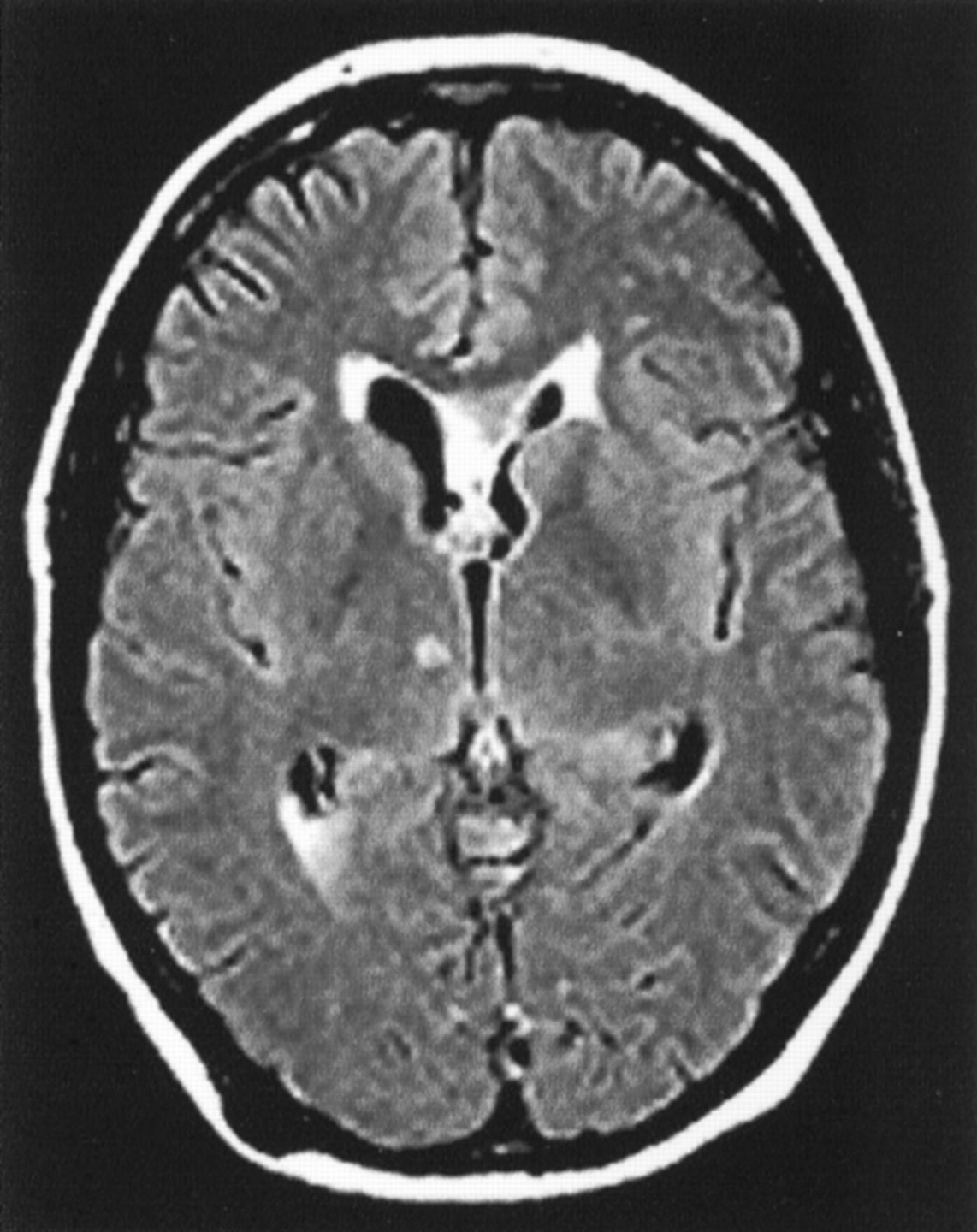
- (1) Artery-to-artery embolism due to large artery disease; posteromedial territory
- (2) Small artery disease with long-standing history of hypertension or diabetes mellitus; ventrolateral territory
- (3) Cardiac sources of embolism includes fibrillation, left ventricular dyskinetic segment, intracardiac thrombus or tumor, mitral stenosis
- (4) Mixed etiologies
- (5) Uncommon etiologies

Diagnosis

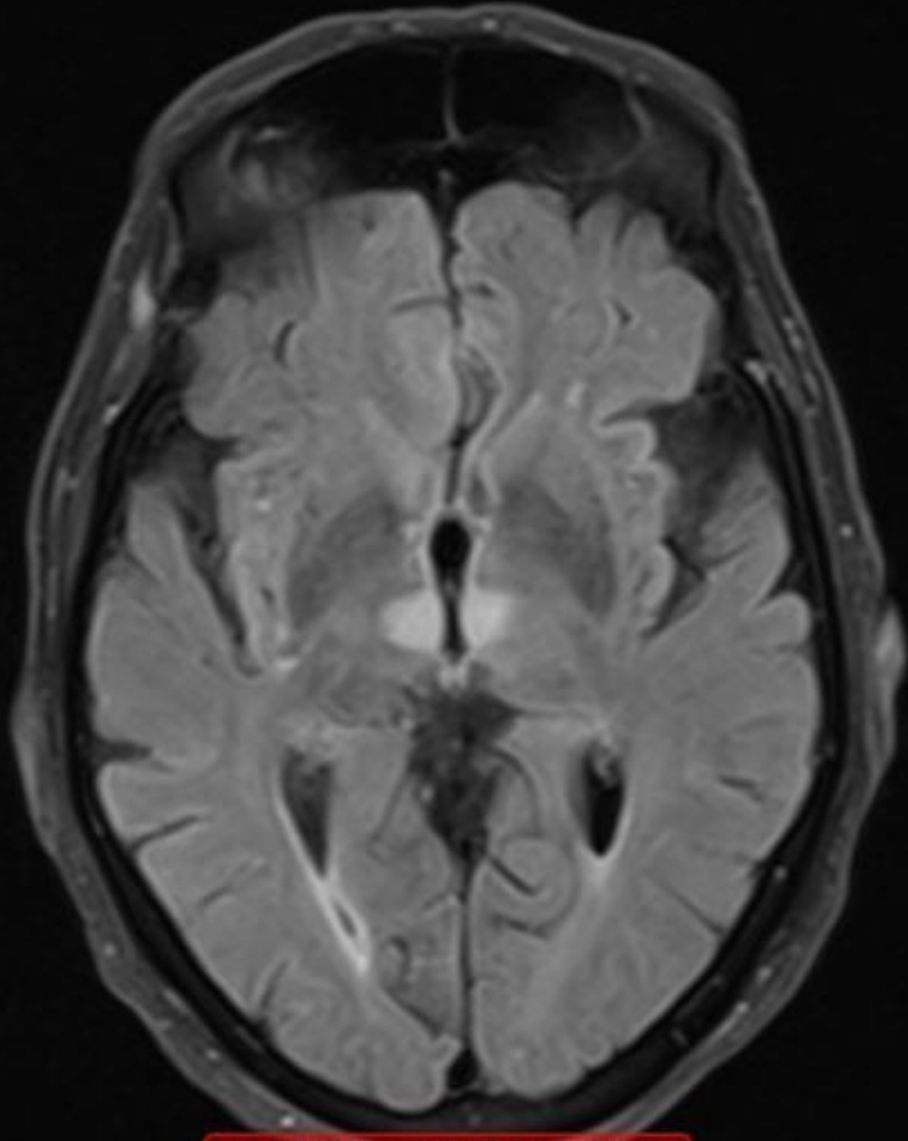
- Physical Examination: testing deep tendon reflexes, muscle tone, coordination, and sensory functions
- MRI
- CT
- CT Angiography/MR Angiography
- Blood Tests: including complete blood count, electrolytes, blood glucose levels, and coagulation studies
- PET: Hypometabolism
- EEG
- Diffusion Tensor Imaging
- Memory tests
- Cognitive Assessments
- Screening for metabolic causes



- Extensive tuberothalamic artery territory infarction on the left and small lesions in the territory of the inferolateral arteries on the right.
- Bilateral stroke is more usually seen after paramedian artery infarcts.



- Unilateral thalamic infarction in the territory of the paramedian artery
- arousal and memory confusion, agitation, aggression, and apathy
- Right sided lesion: Hemineglect and spatial deficits
- Chronotaxis



NOT FOR MEDICAL USAGE

Artery of Percheron Infarction

Artery of Percheron territory infarcts are thought to account for 4-18% of all thalamic ischemic strokes.

COMA if Bilateral

Altered consciousness

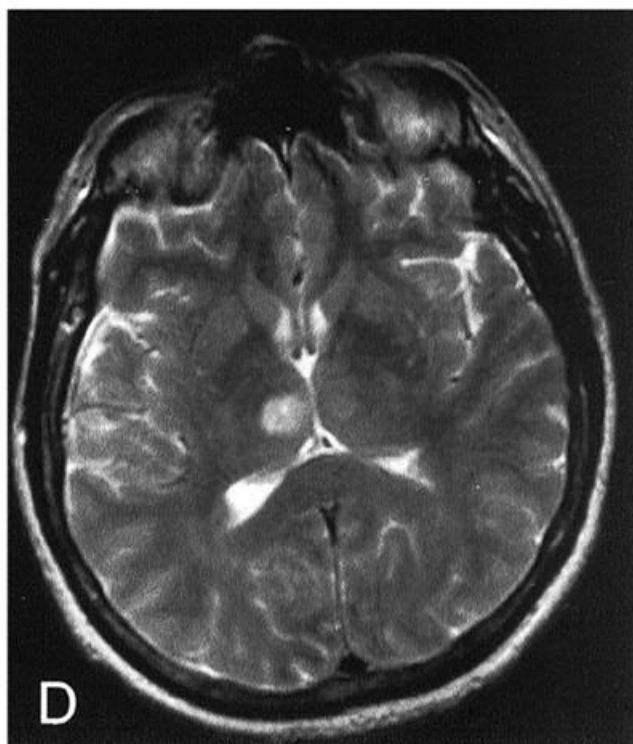
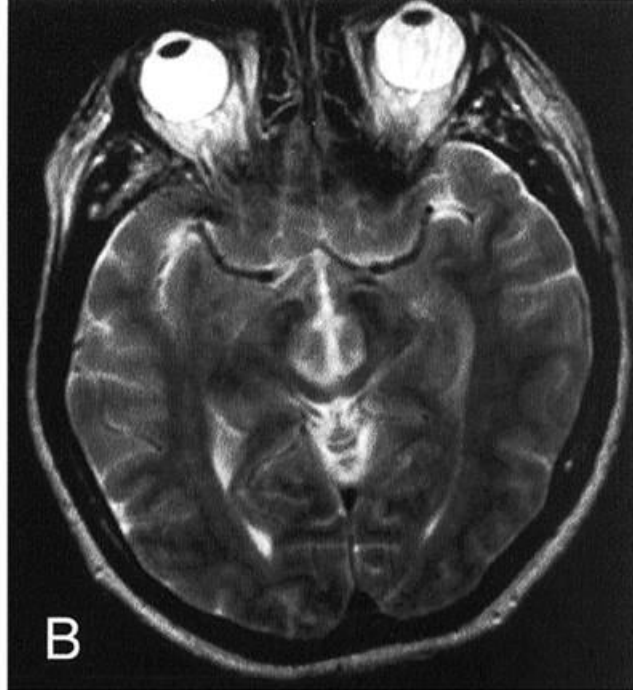
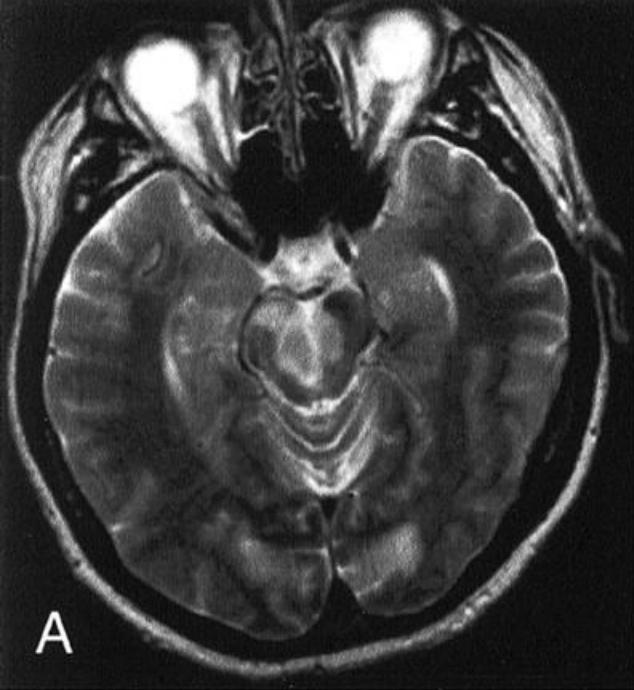
Memory impairment

Aphasia

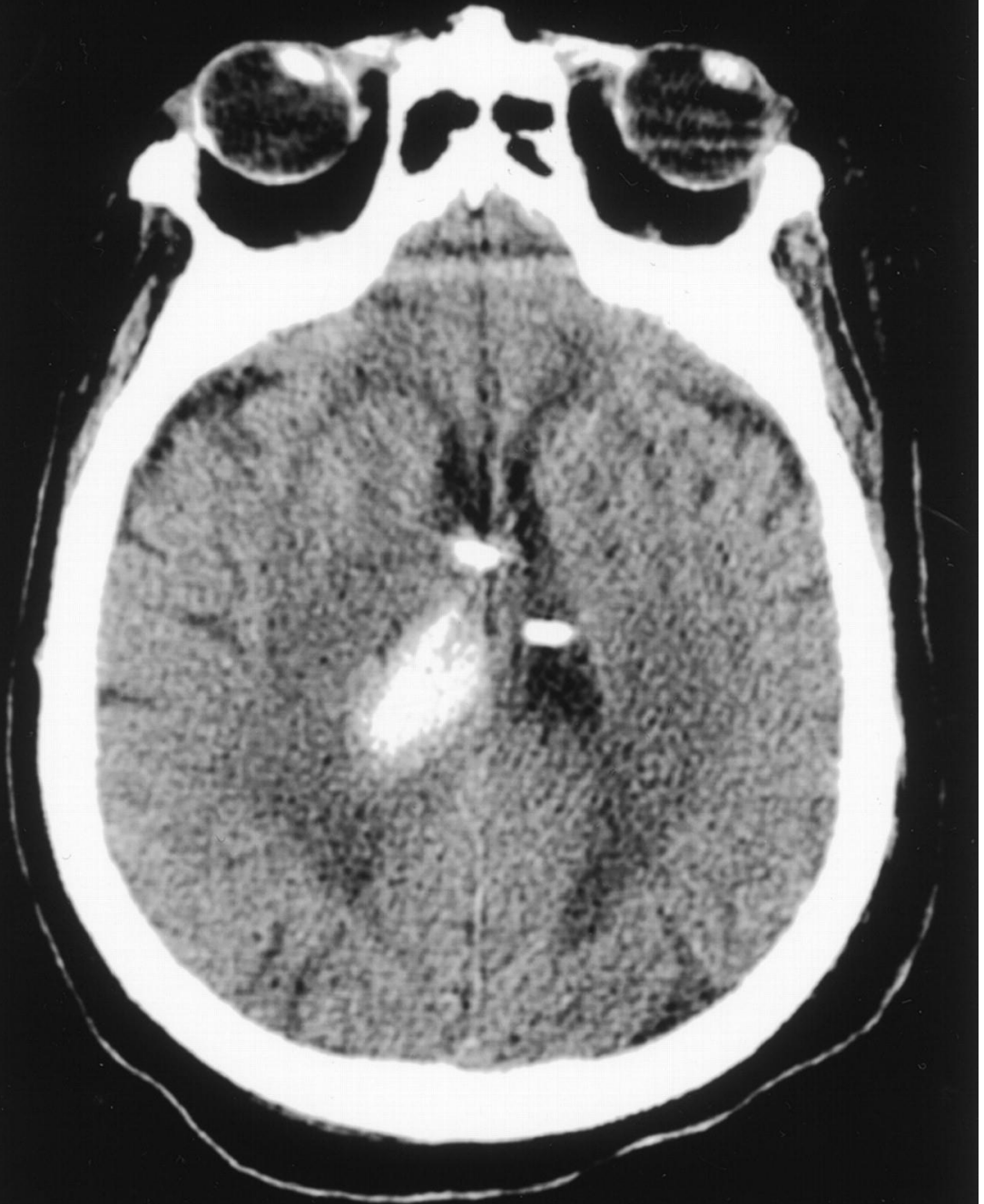
Hemiparesis

Hemiplegia

Personality changes

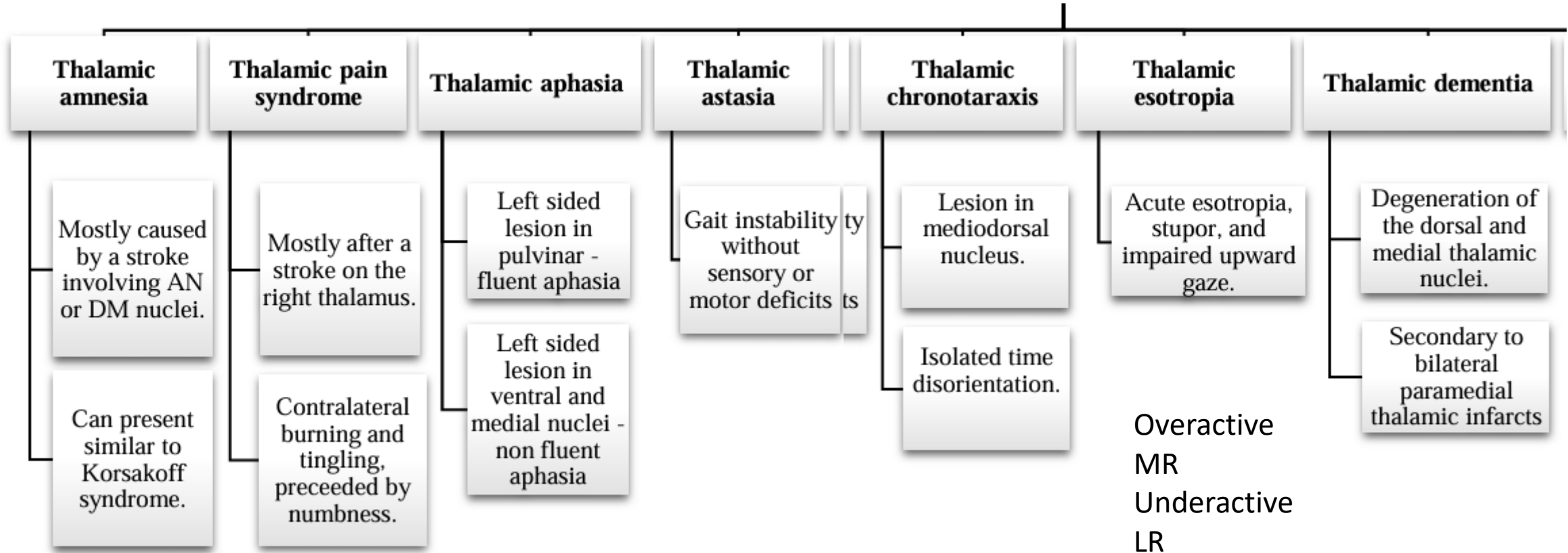


- Bilateral infarction in the paramedian artery territory may result in an acutely ill and severely impaired patient.
- Disorientation, confusion, hypersomnolence, deep coma, “coma vigil” or akinetic mutism (awake unresponsiveness), and severe memory impairment with perseveration and confabulation are prominent behavioral features, often accompanied by eye movement abnormalities. The anterograde and retrograde memory deficit and apathy.
- Chronotaxis



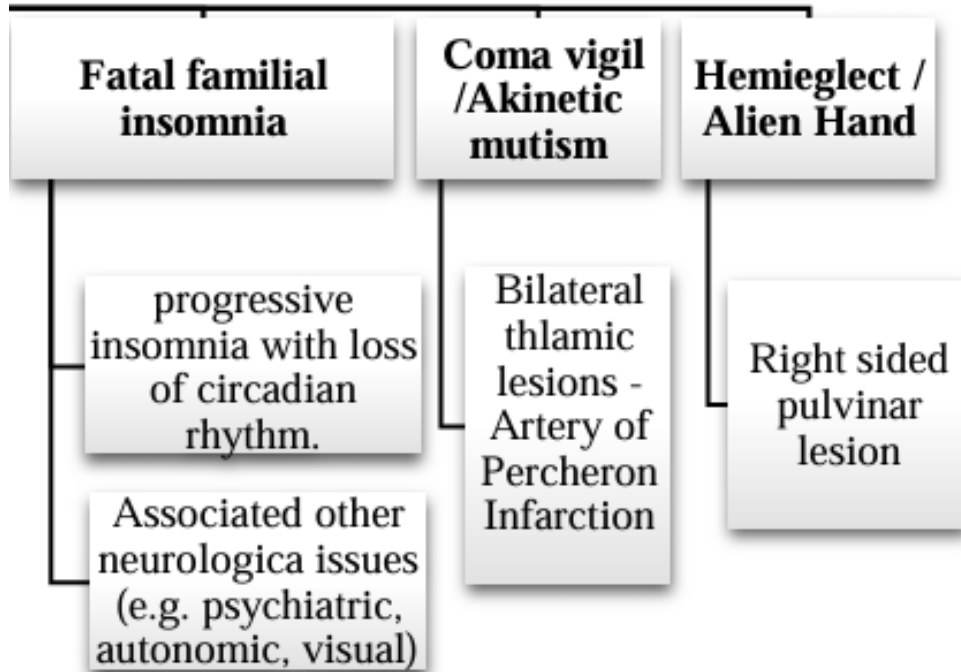
In a thalamic stroke, the disruption of the MLF and PPRF pathways can lead to a paradoxical situation where the eyes deviate away from the lesion: Wrong way eyes with left-gaze deviation and left-sided weakness

Thalamic syndromes



VPL

Thalamic syndromes



AFFECTED

- lexical-semantic deficits
- PULVINAR:
 - fluent type
 - naming deficits (writing + speaking)
 - semantic paraphasias
 - perseveration
- ANTERIOR NCL.
 - reduced word fluency
 - anomia
 - overall higher severity

PRESERVED

- repetition
- reading aloud
- (comprehension)

Ibrahim Alkhodair-July 2021

<https://houstonmedicalclerkship.com/neuro-flow-charts/>

Resources

- <https://www.sciencedirect.com/science/article/pii/S1052305709001232?via%3Dihub>
- <https://houstonmedicalclerkship.com/neuro-flow-charts/>
- <https://radiopaedia.org/articles/thalamic-infarct?lang=us>
- <https://www.neurology.org/doi/10.1212/01.WNL.0000065900.62880.4F>