Stroke Neuroanatomy

A Whirlwind Tour

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Outline

Focussed introduction to anatomy of…

Language
Motor Power
Sensation
Vision
Gaze
Coordination

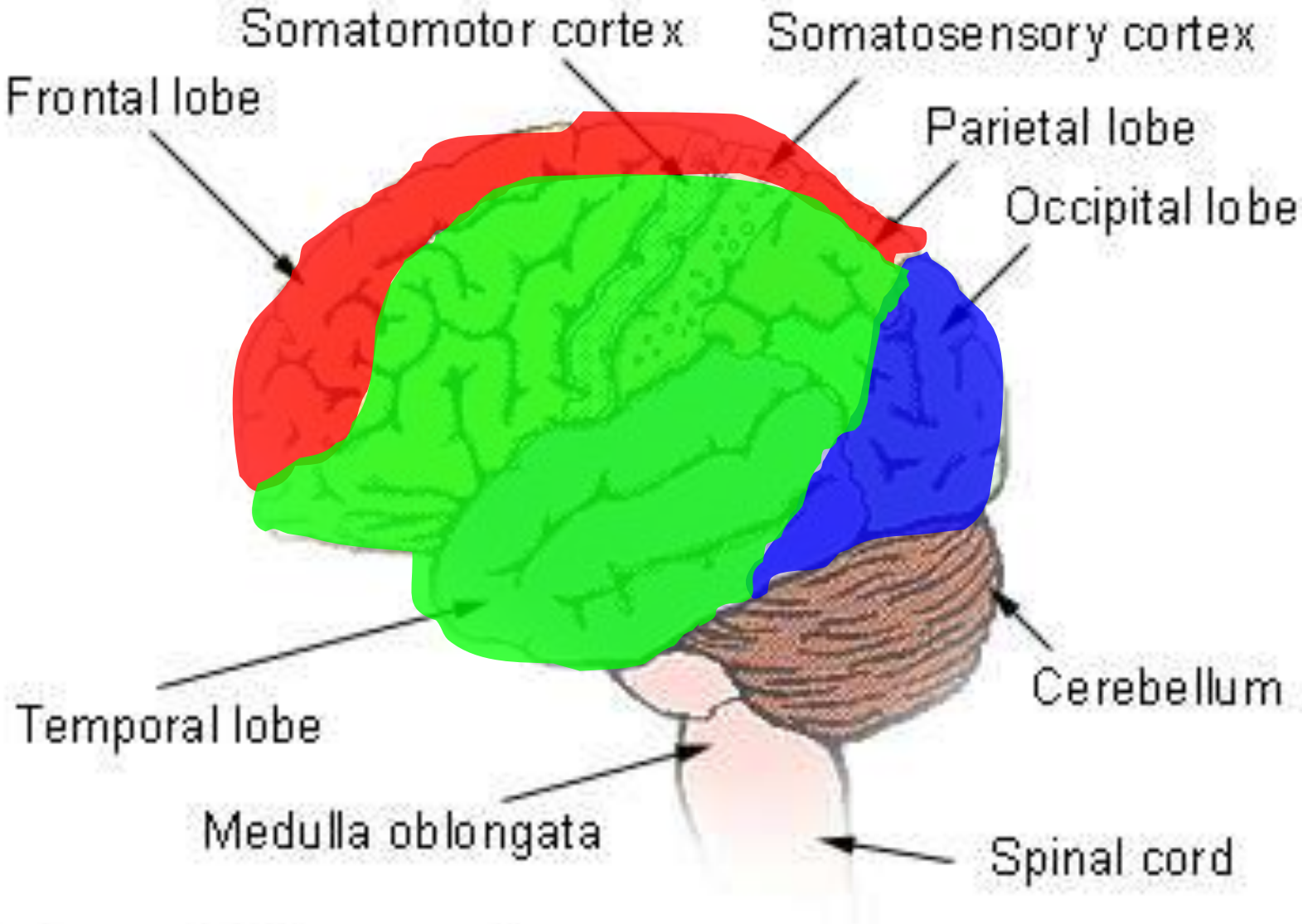
Localization: How and Why

Loss of function predicts location of lesion

… suggests vessels and cause

… informs treatment

… impacts prognosis



Lobes of the cerebrum

Language

The Aphasias

Aphasia

Disruption in language function

NON-FLUENT (BROCA'S)

FLUENT (WERNICKE'S)

GLOBAL

TRANSCORTICAL

CONDUCTION

Approach to Aphasia

Break language down into 2 parts

Output (speech)

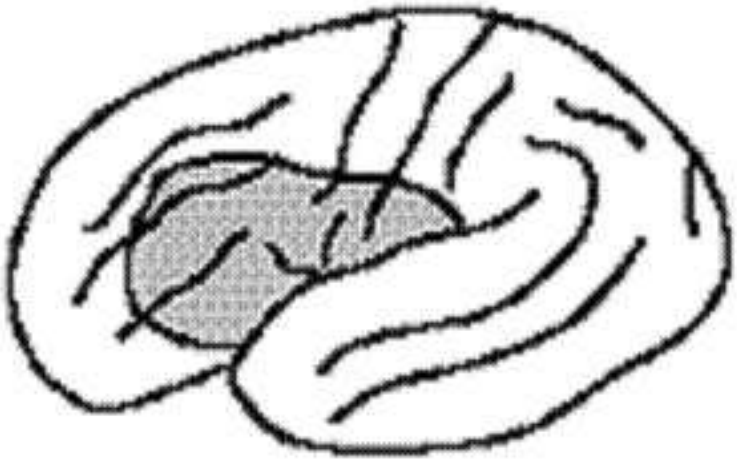
Input (comprehension)

Output (Broca's)

Inferior Frontal

Frontal Operculum

Middle Cerebral Artery (MCA)



Halting

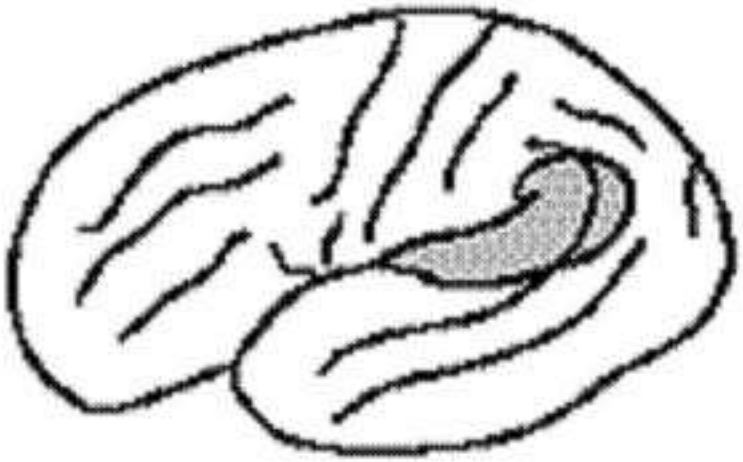
Effortful

Agrammatic

Input (Wernicke's)

Posterior Temporal

Middle Cerebral Artery (MCA)



Well-woven

Effortless

Melodic

Output + Input (Global)

Broca's +
Wernicke's

LARGE Middle Cerebral Artery (MCA)

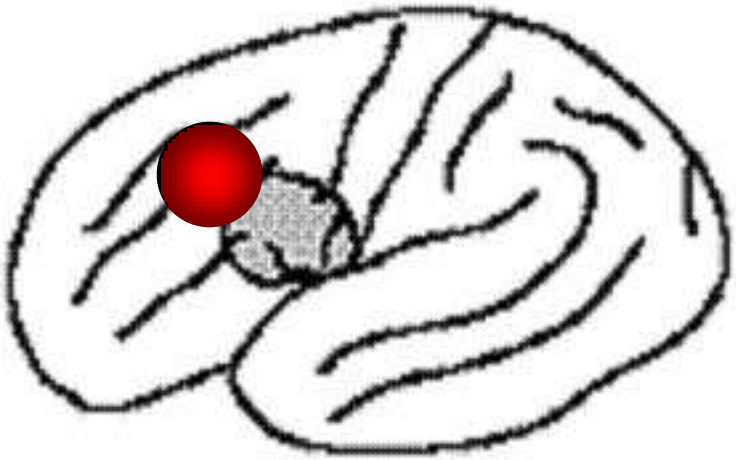
All speech affected

Mute

“Output” (Transcortical Motor)

Superior Frontal

Middle Cerebral Artery (MCA)



Like Broca

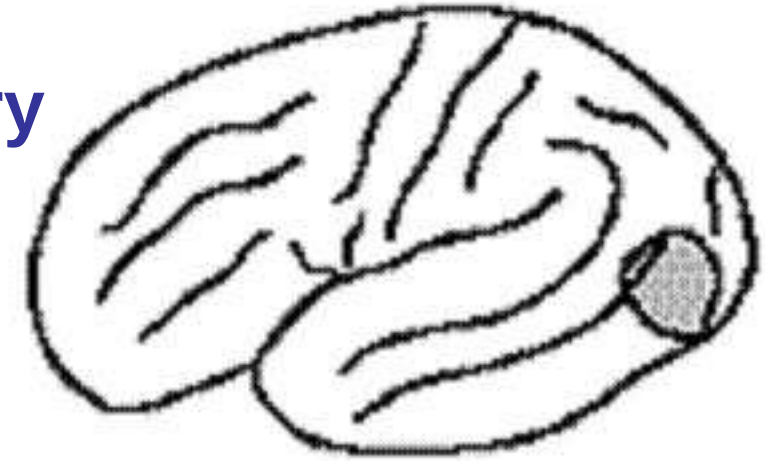
Less Severe

Can Repeat and Name

“Input” (Transcortical Sensory)

Posterior Temporal

Middle Cerebral Artery (MCA)



Like Wernicke

Less Severe

Can Repeat and Name

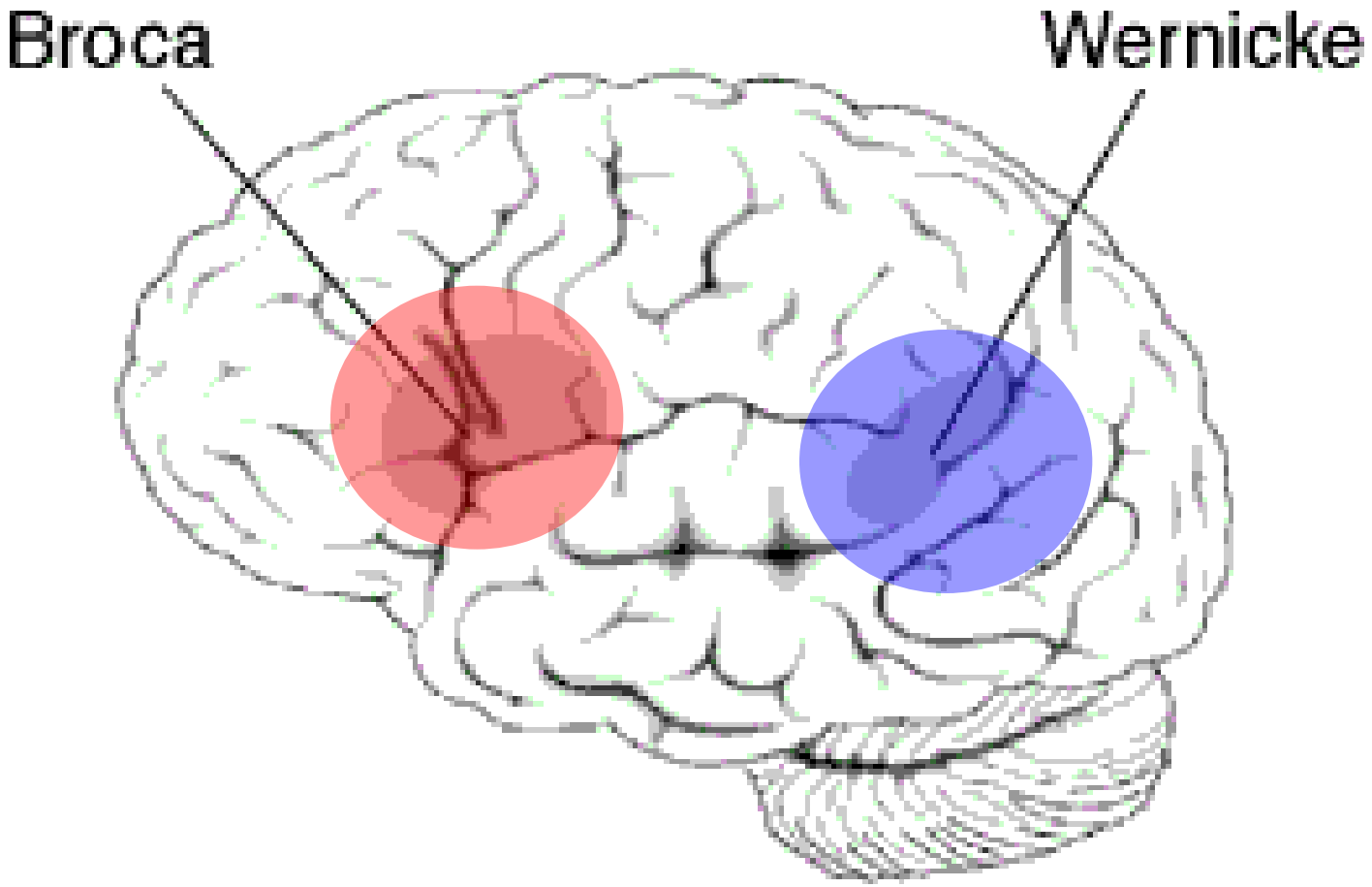
Disconnection (Conduction)

Posterior Perisylvian
Subcortical

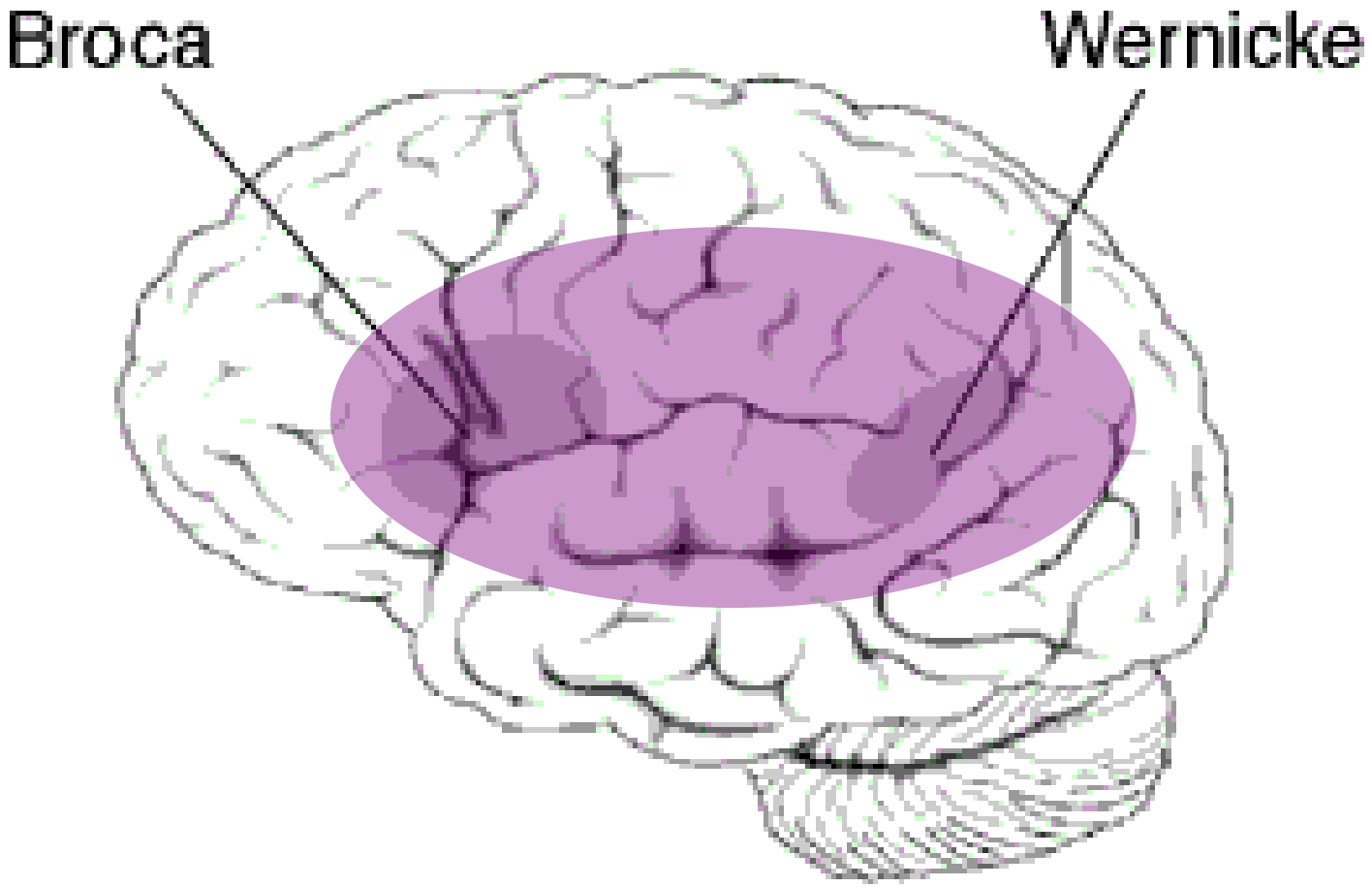
SMALL Middle
Cerebral Artery (MCA)

Poor repetition
Poor naming
Good speech & understanding

Summary of Aphasias



Summary of Aphasias



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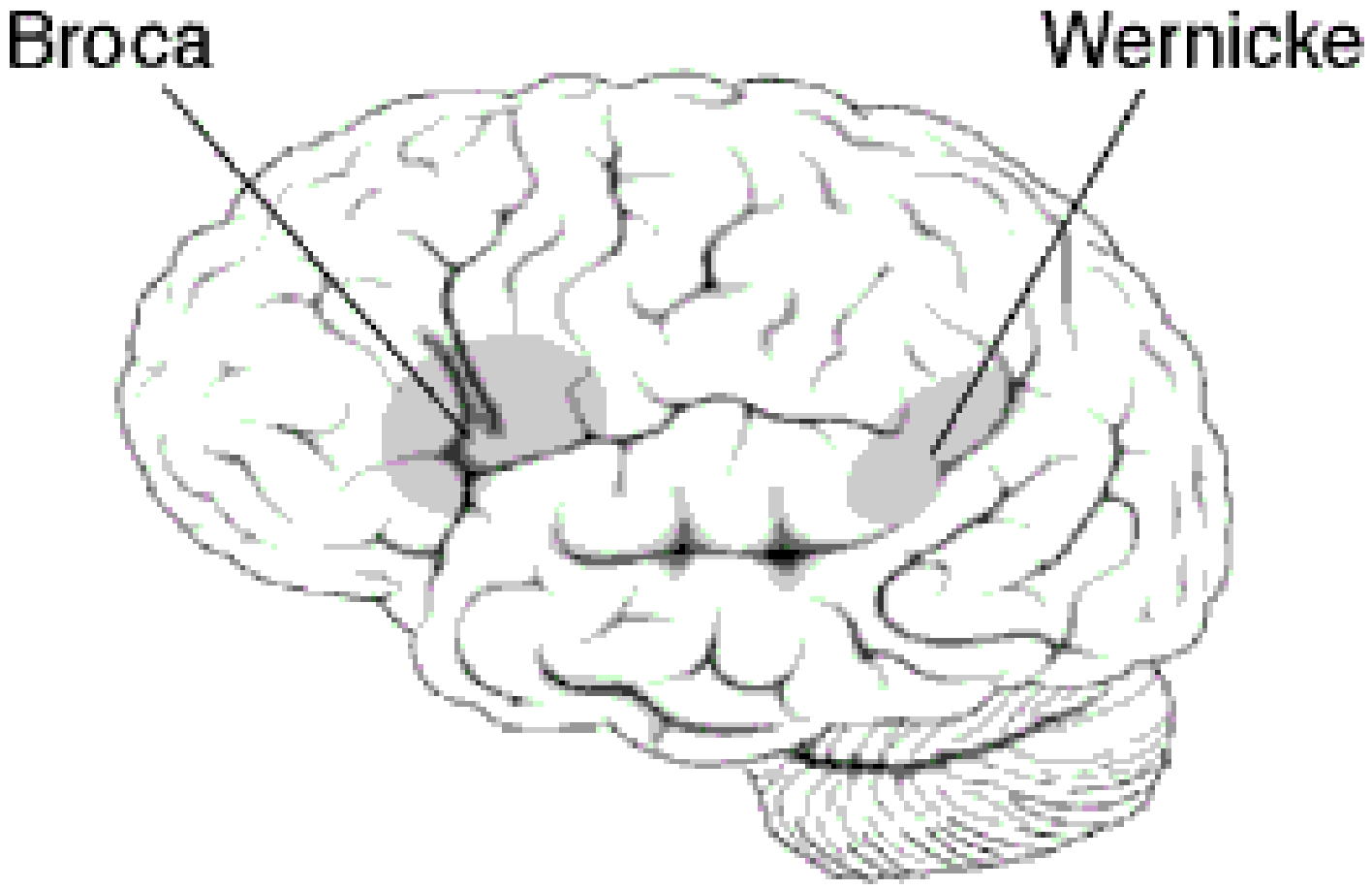

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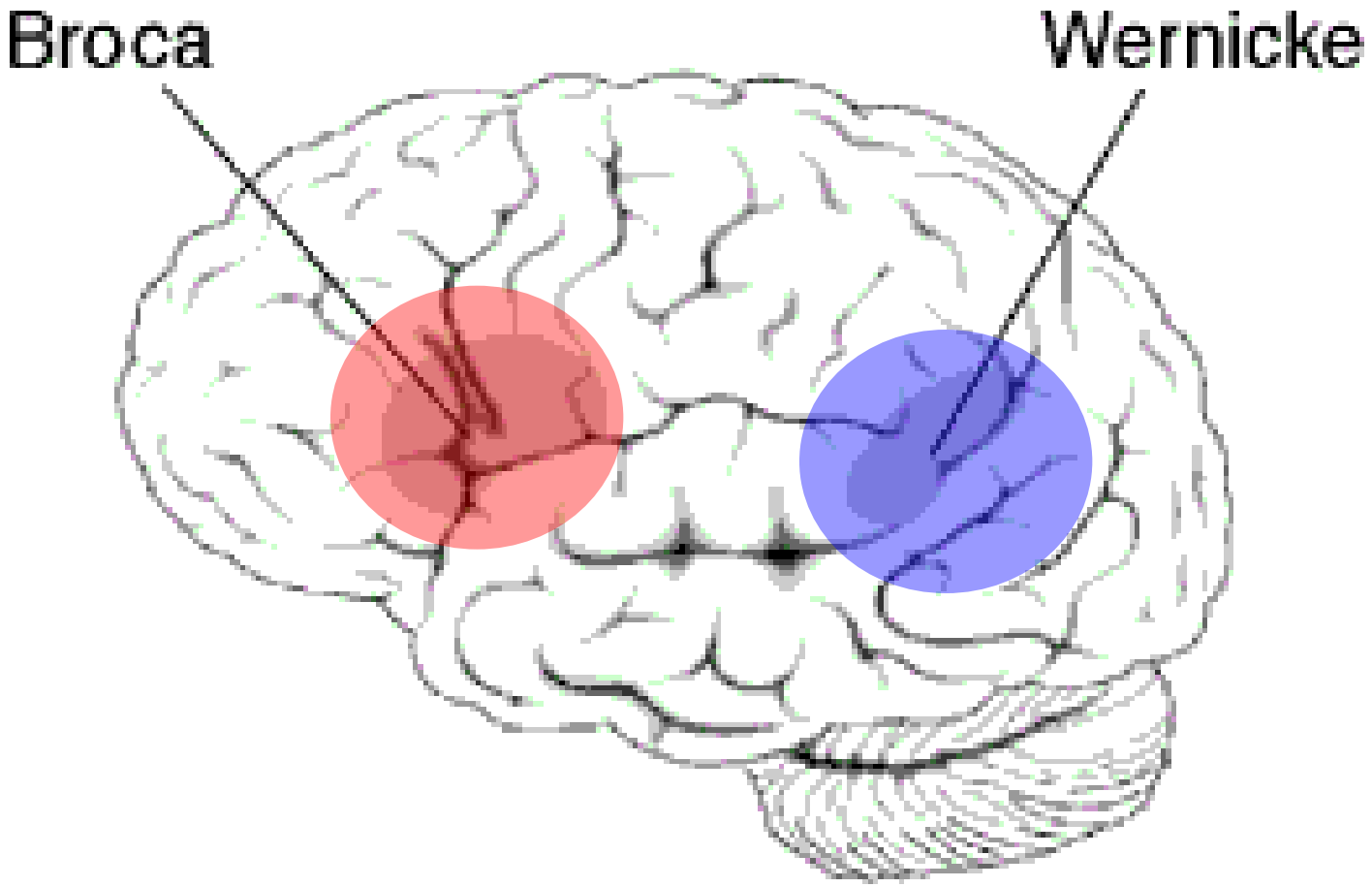

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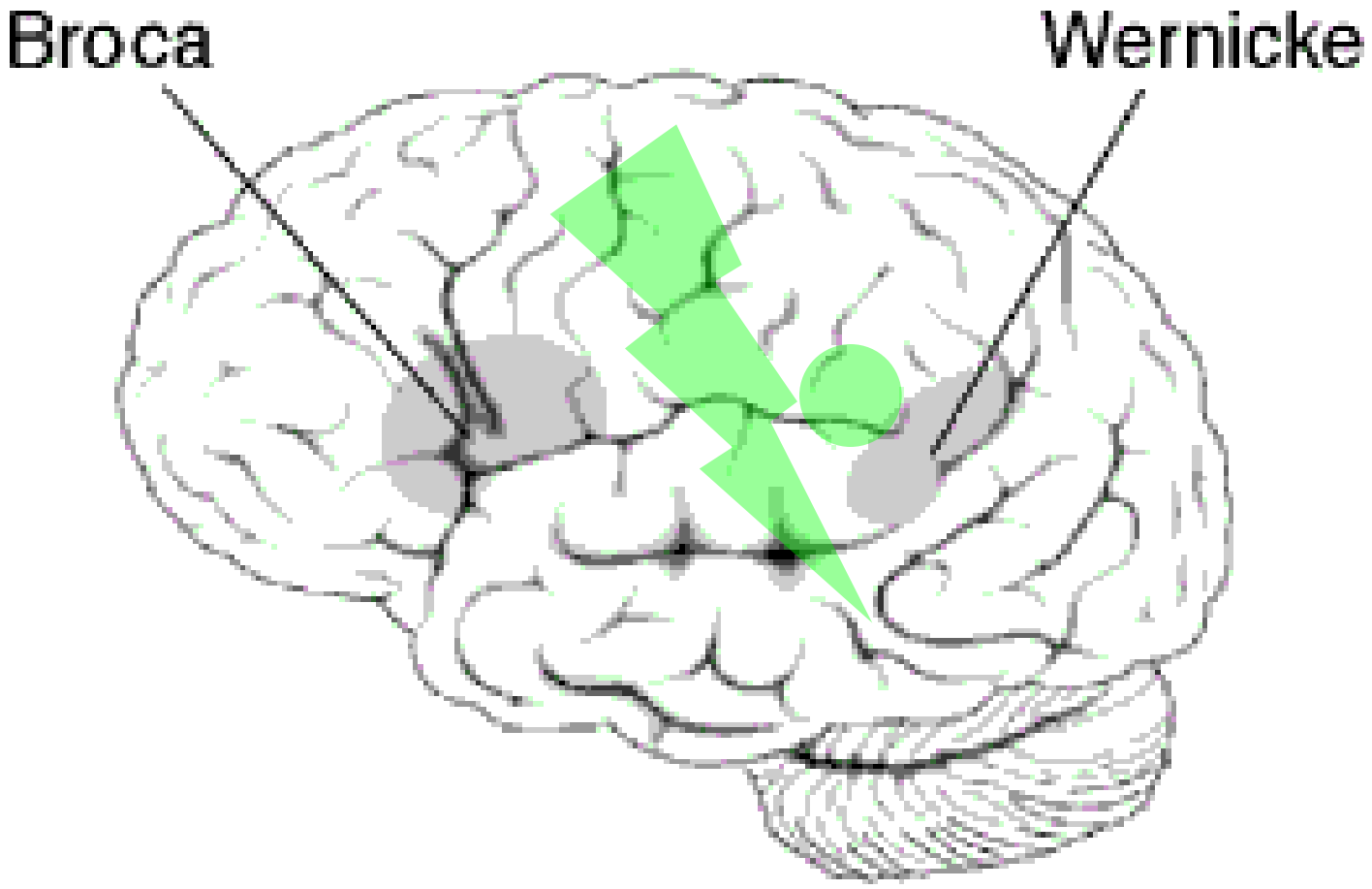


Summary of Aphasias

	Speech	Understanding	Repetition	Naming
Broca	↓	Good	↓	↓
Wernicke	Good	↓	↓	↓
Global	↓	↓	↓	↓
Transcortical Motor	↓	Good	Good	Good
Transcortical Sensory	Good	↓	Good	Good
Conduction	Good	Good	↓	↓

Rule of Aphasias

Middle Cerebral Artery

LEFT sided usually

- **In left handed individuals, 25% have language on the RIGHT or BILATERAL**

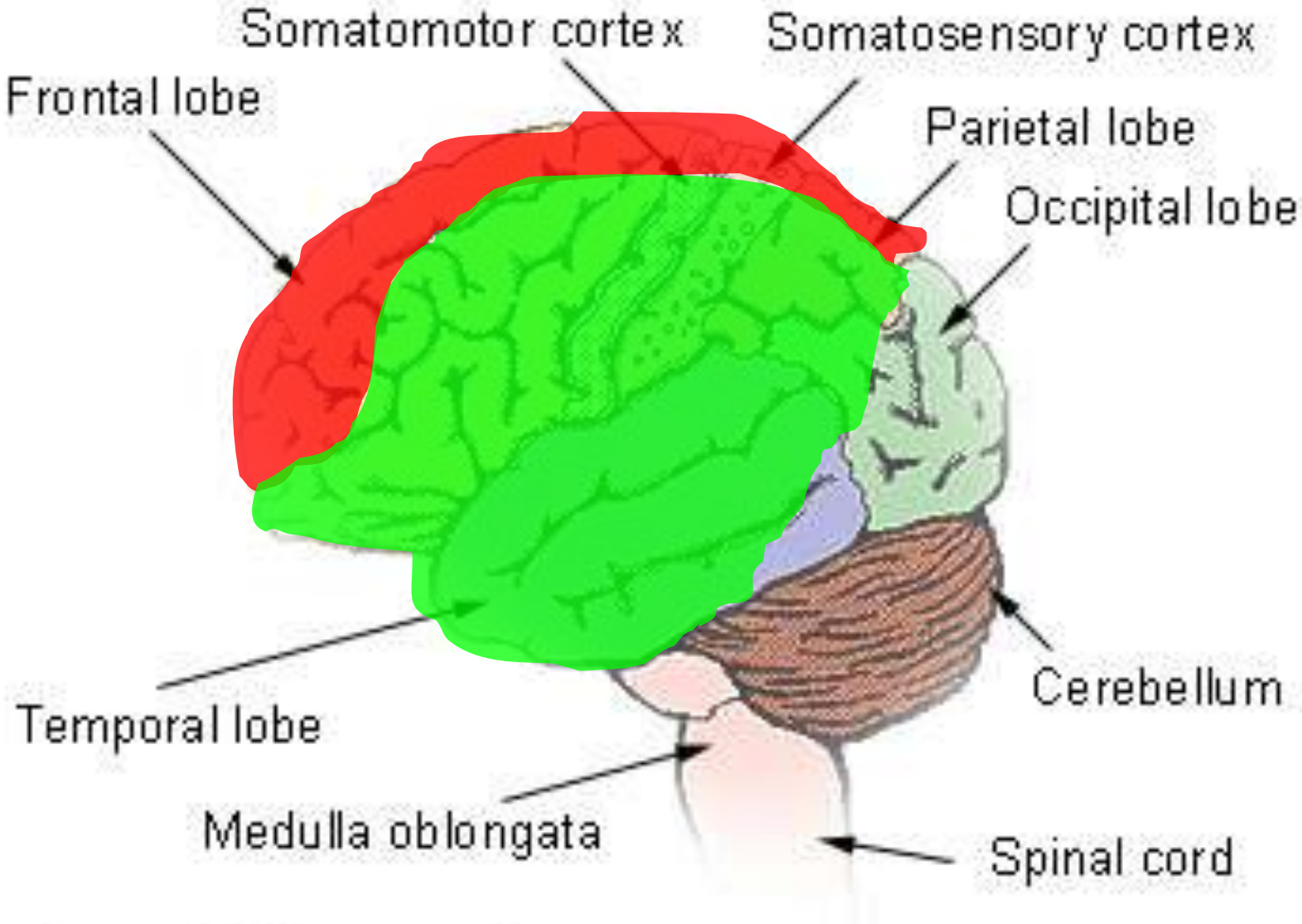
Motor Power

Hemiparesis

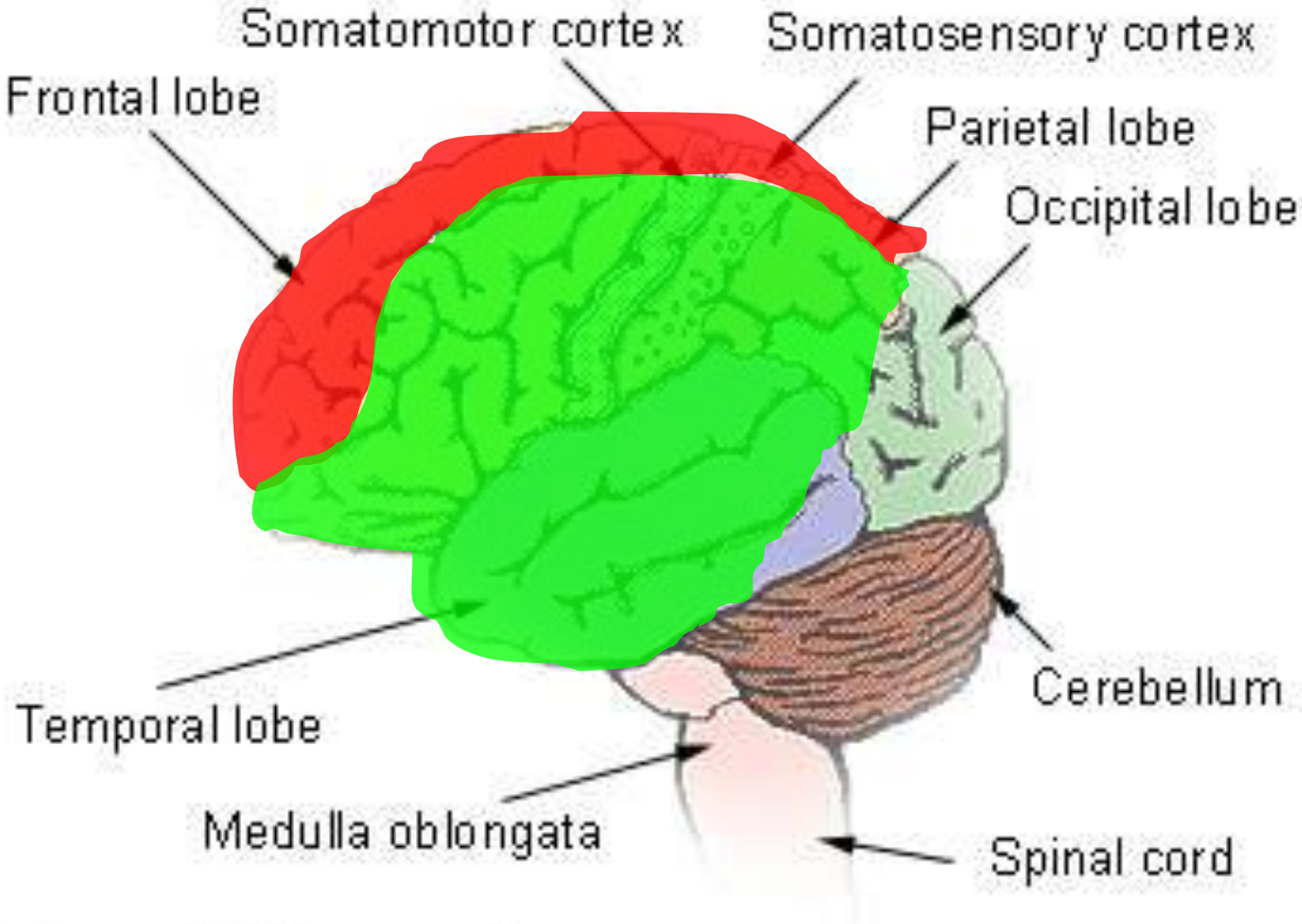
Rule for Weakness

Weakness is always
on the opposite side of the stroke

… except in brainstem strokes



Lobes of the cerebrum



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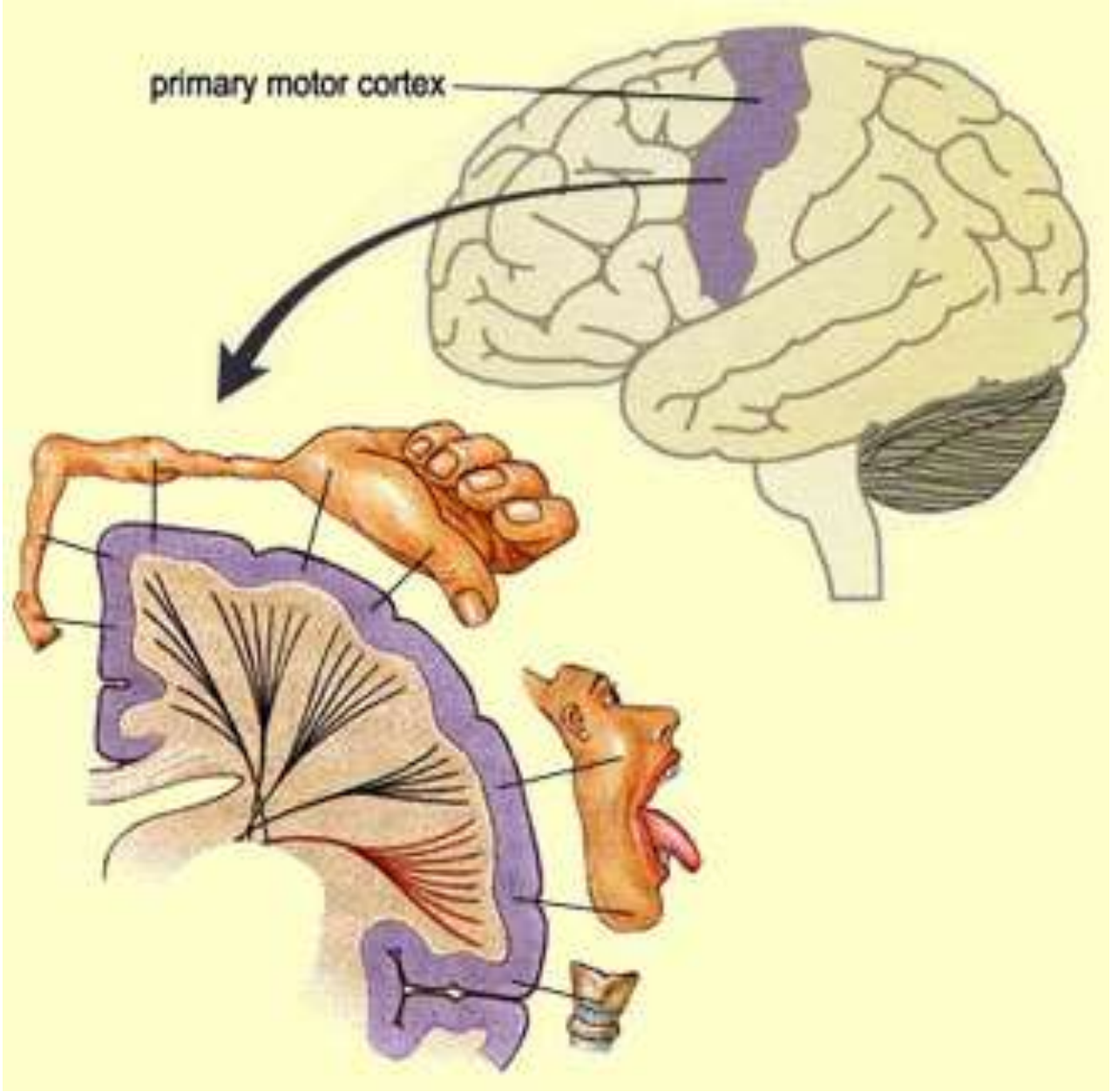
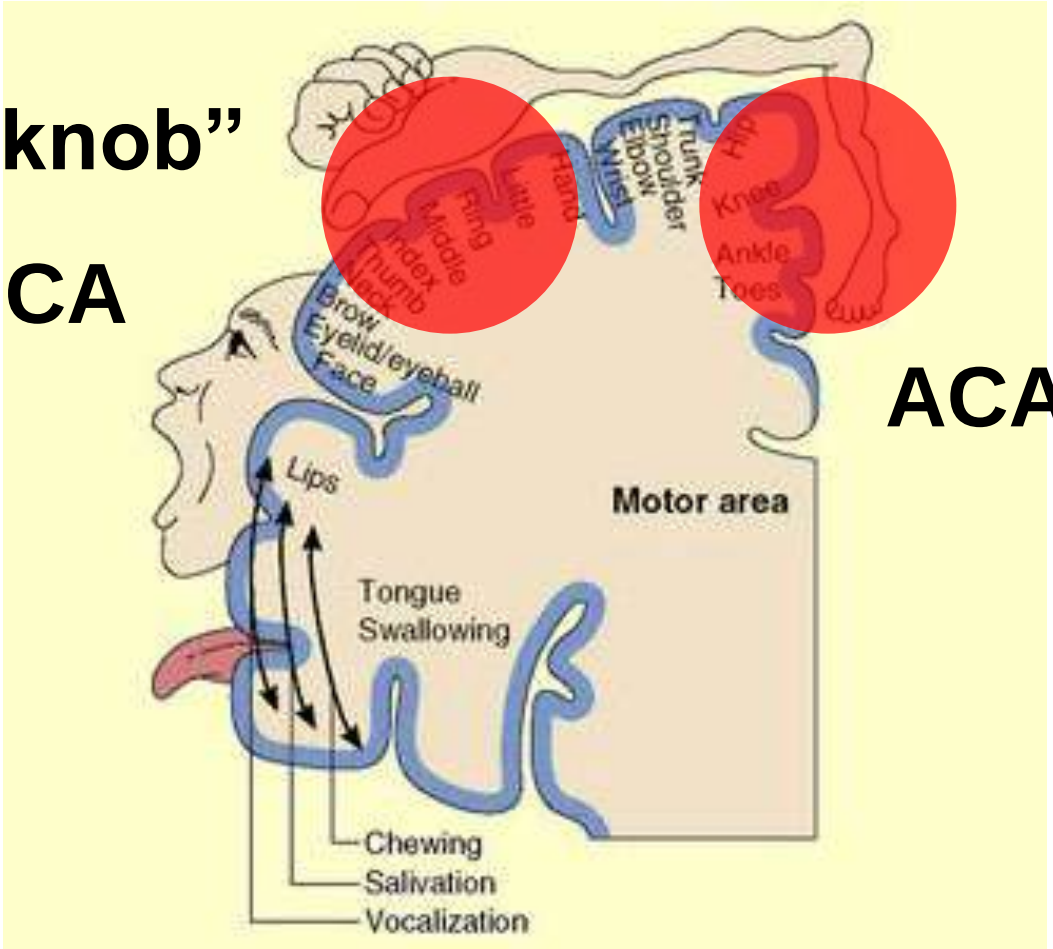

primary motor cortex

Somatotopic Representation

“Hand knob”

High MCA branch

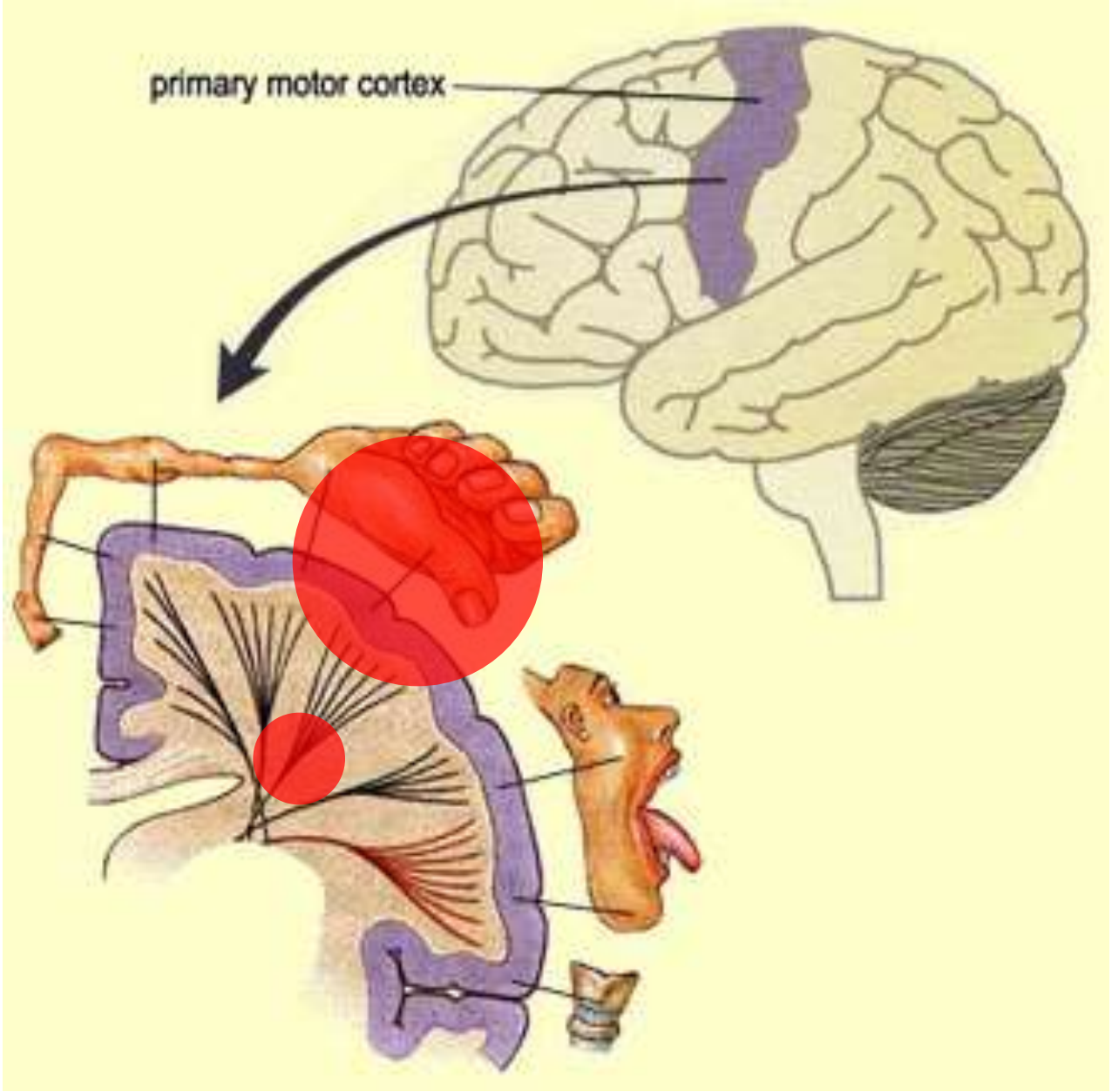


ACA Stroke

Cortical Versus Subcortical

Cortical: Destruction of neurons

Sub-Cortical: Destruction of neuronal connections


primary motor cortex

Cortical Versus Subcortical

Cortical: Multiple functions affected

Sub-Cortical: Targeted function loss

“Pure motor stroke”

Pure motor stroke…

… likely smaller

… could be lacunar

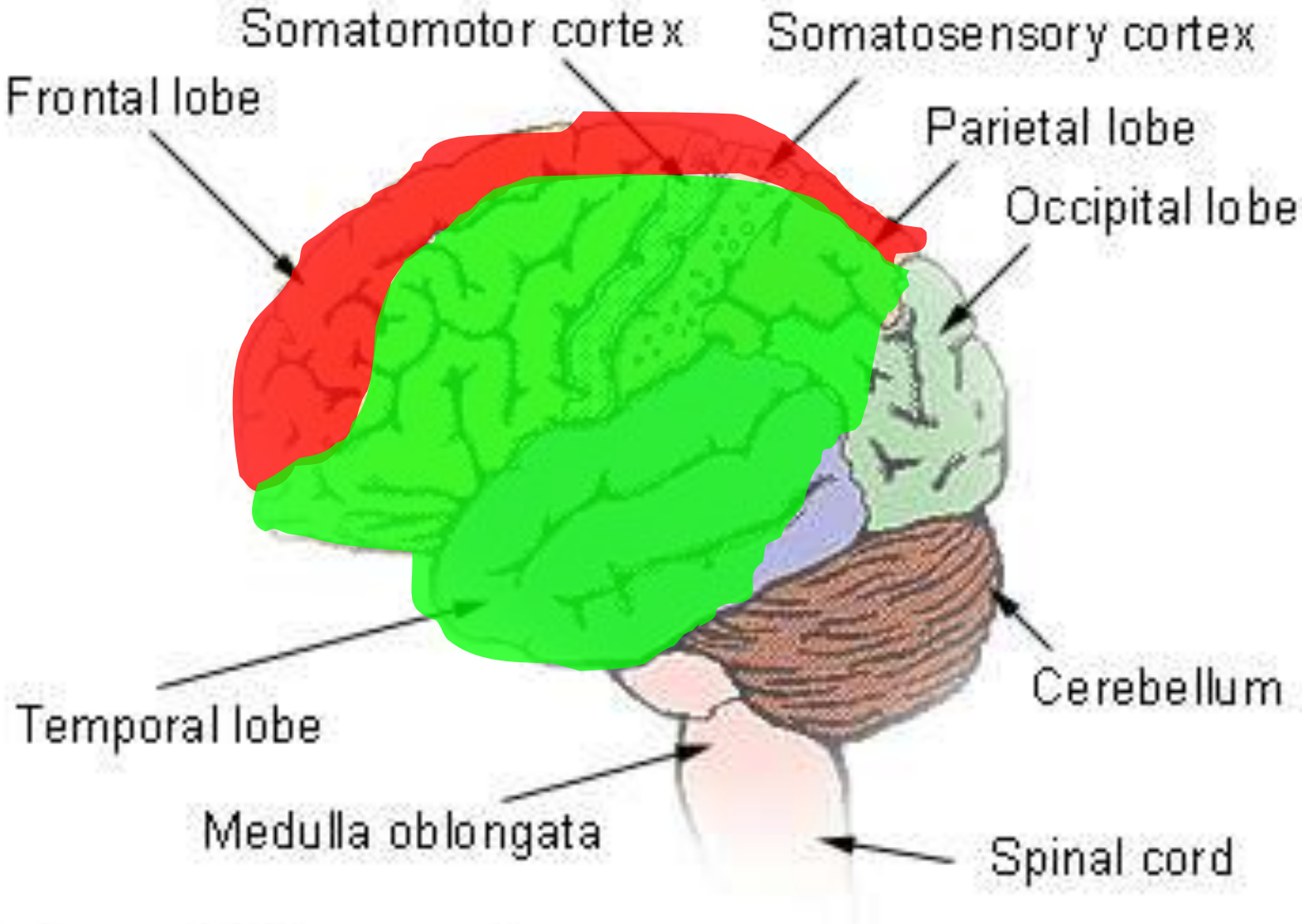
… if lacunar, then tPA is useless

Sensation

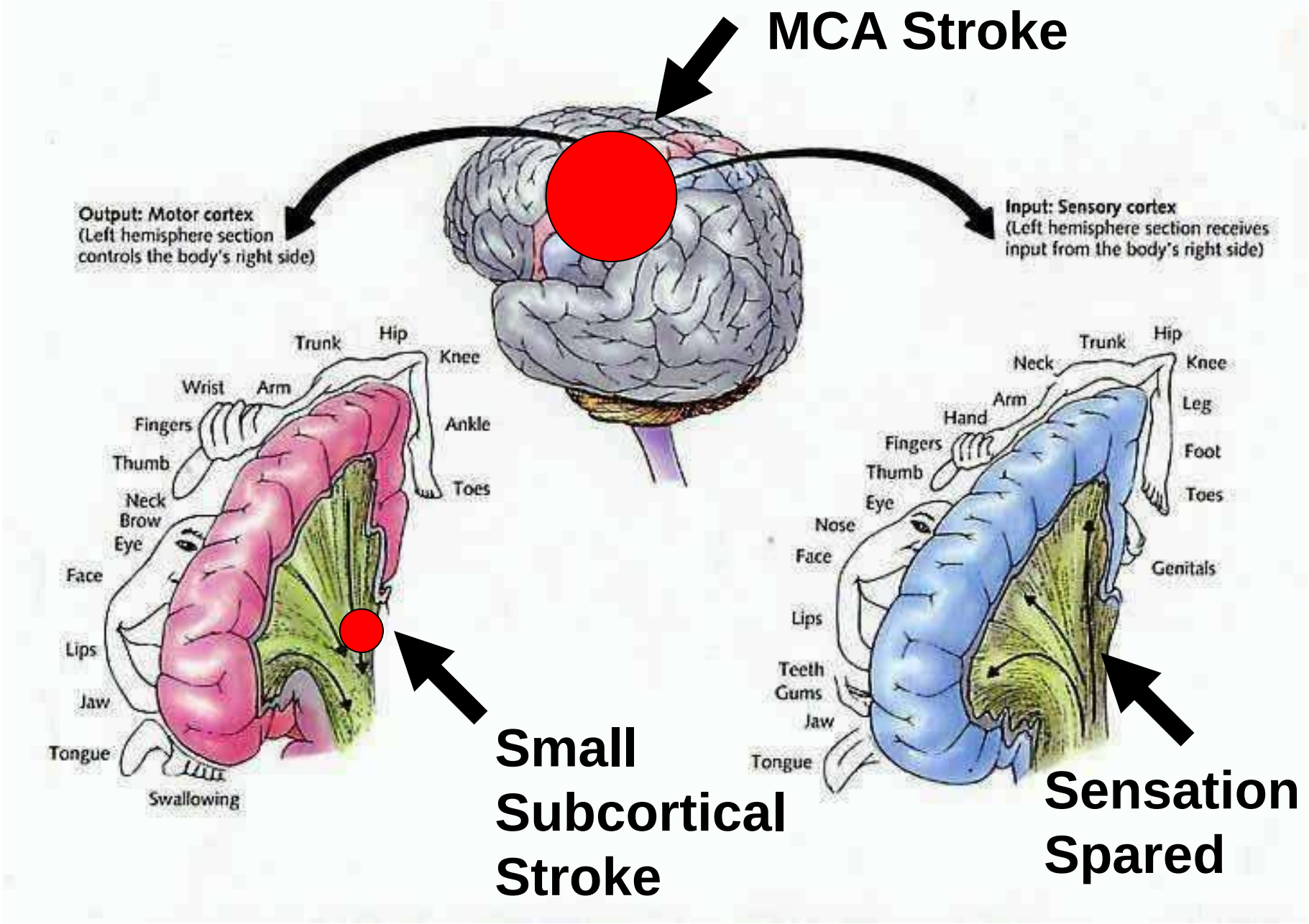
Motor Power Anatomy Revisited

Cardinal Rule for Sensory Loss

Loss of sensation is always
on the opposite side of the stroke



Lobes of the cerebrum


MCA Stroke
Output: Motor cortex
(Left hemisphere section
controls the body's right side)
Input: Sensory cortex
(Left hemisphere section receives
input from the body's right side)
Trunk
Hip
Knee
Wrist
Arm
Fingers
Ankle
Thumb
Toes
Neck
Brow
Eye
Face
Lips
Jaw
Tongue
Swallowing
Trunk
Hip
Neck
Knee
Arm
Leg
Hand
Fingers
Foot
Thumb
Toes
Eye
Nose
Face
Genitals
Lips
Teeth
Gums
Jaw
Tongue
Small
Subcortical
Stroke
Sensation
Spared

Vision

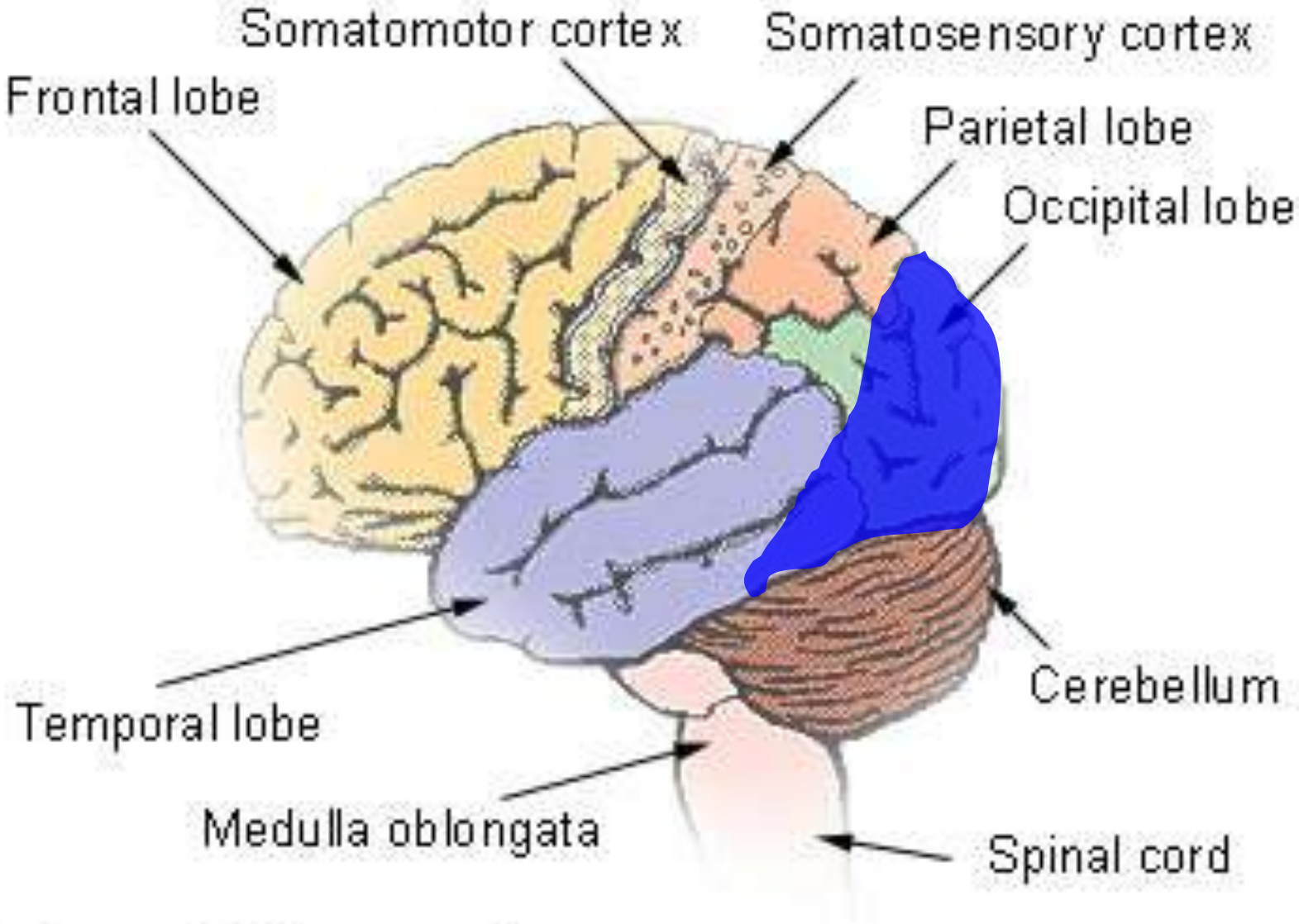
Posterior Cerebral Artery… usually

Vision

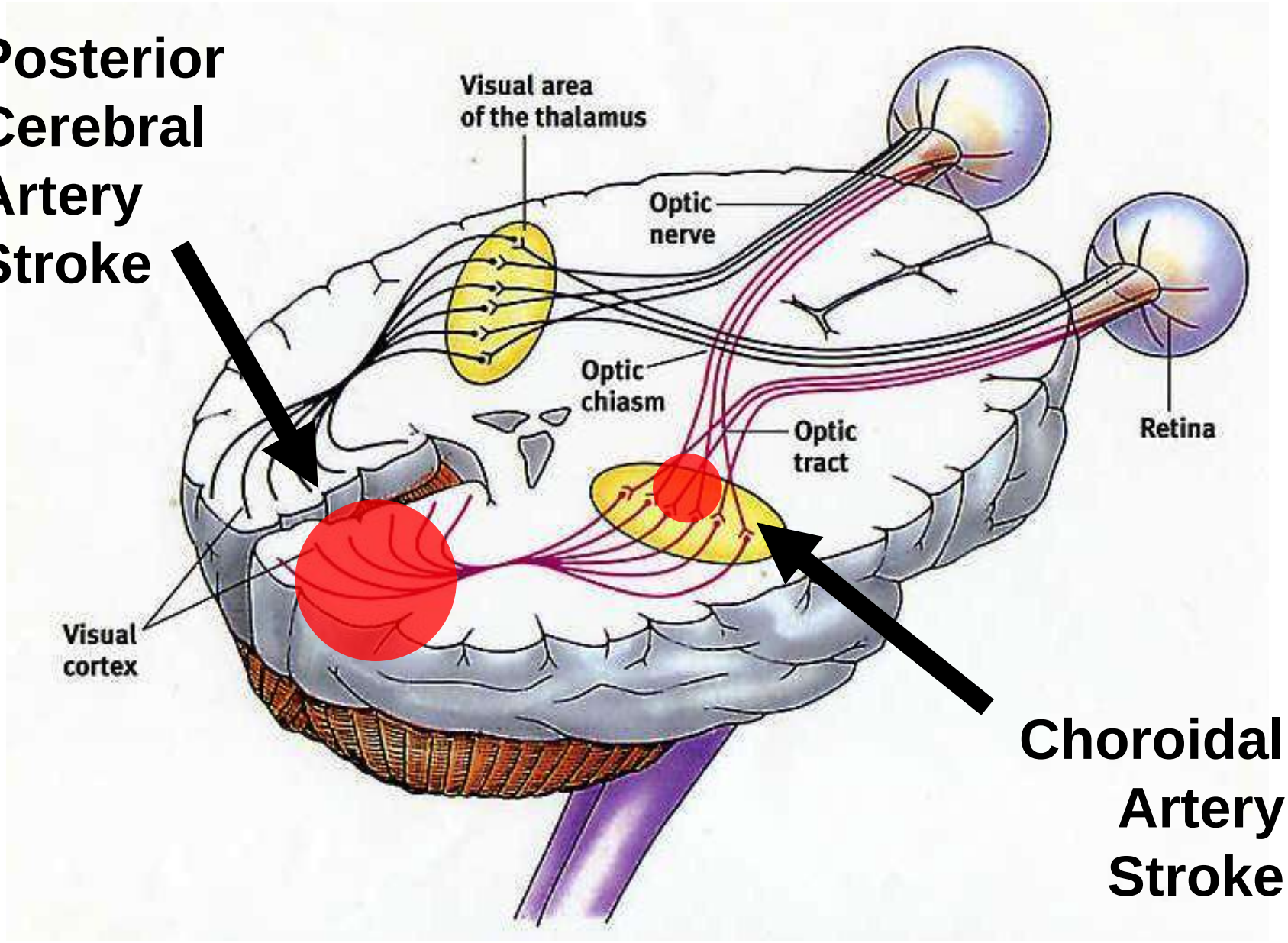
Damage to the visual cortex (occipital lobe)

OR

Damage to the visual pathways (subcortical)



Lobes of the cerebrum


Posterior Cerebral Artery Stroke
Visual area of the thalamus
Optic nerve
Optic chiasm
Optic tract
Retina
Visual cortex
Choroidal Artery Stroke

Gaze

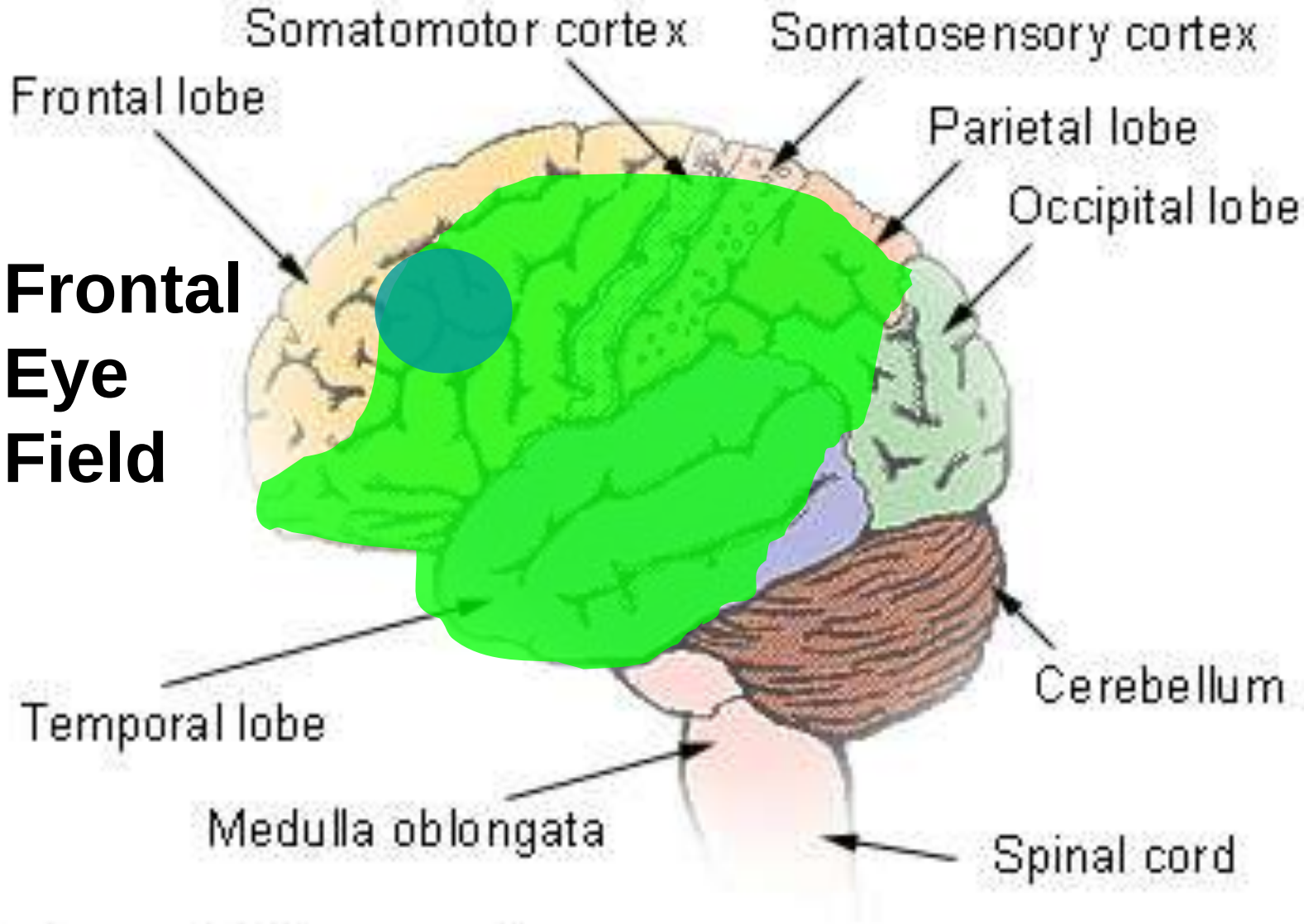
The Frontal Eye Fields

Rule of Gaze

The patient will

look TOWARDS

the side of the stroke

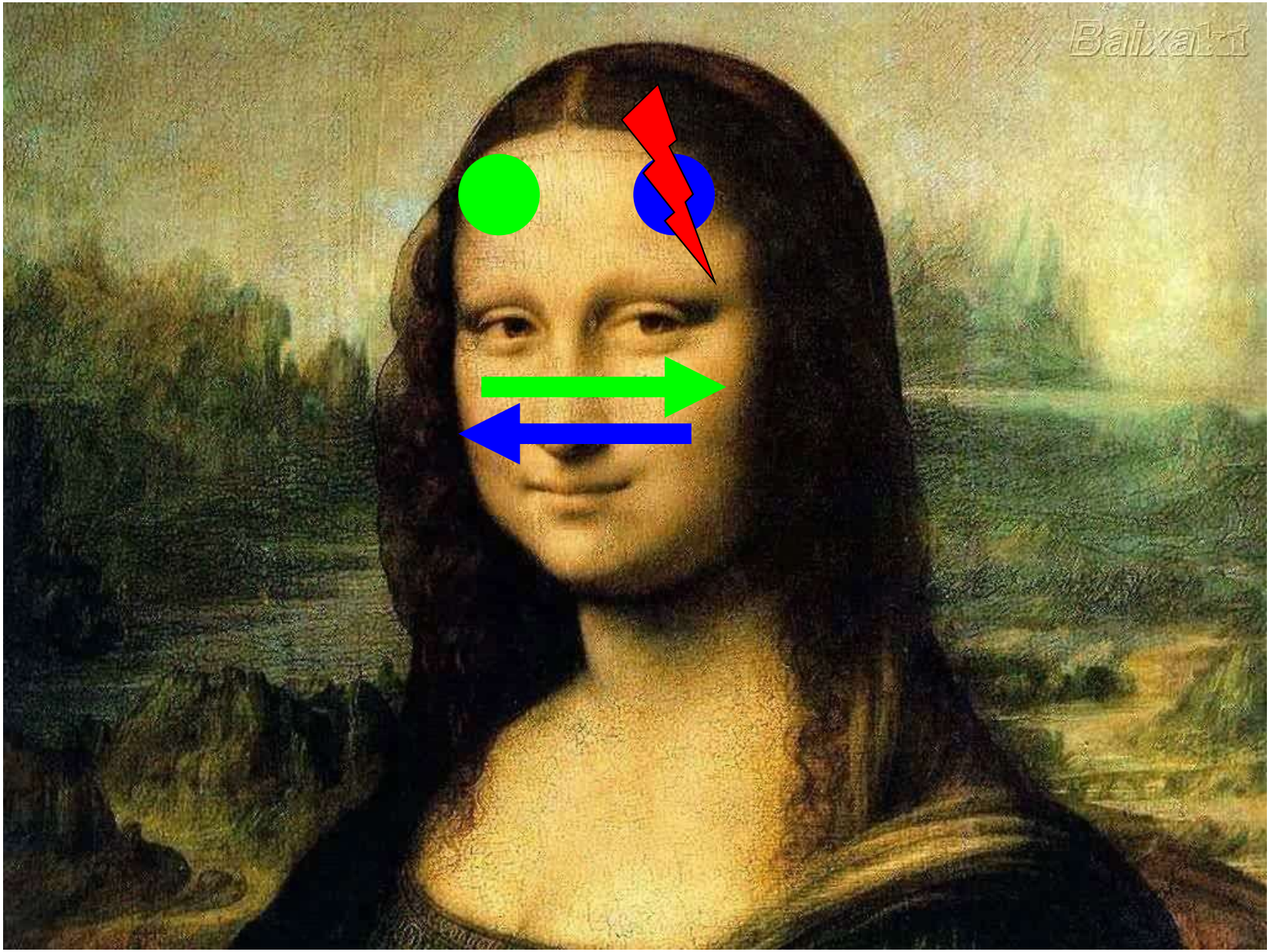


Lobes of the cerebrum

Frontal Eye Field

The frontal eye field drives gaze to the opposite side

When damaged, the frontal eye field on the opposite, healthy side, drives the eyes towards the stroked side


Baixaki

Coordination

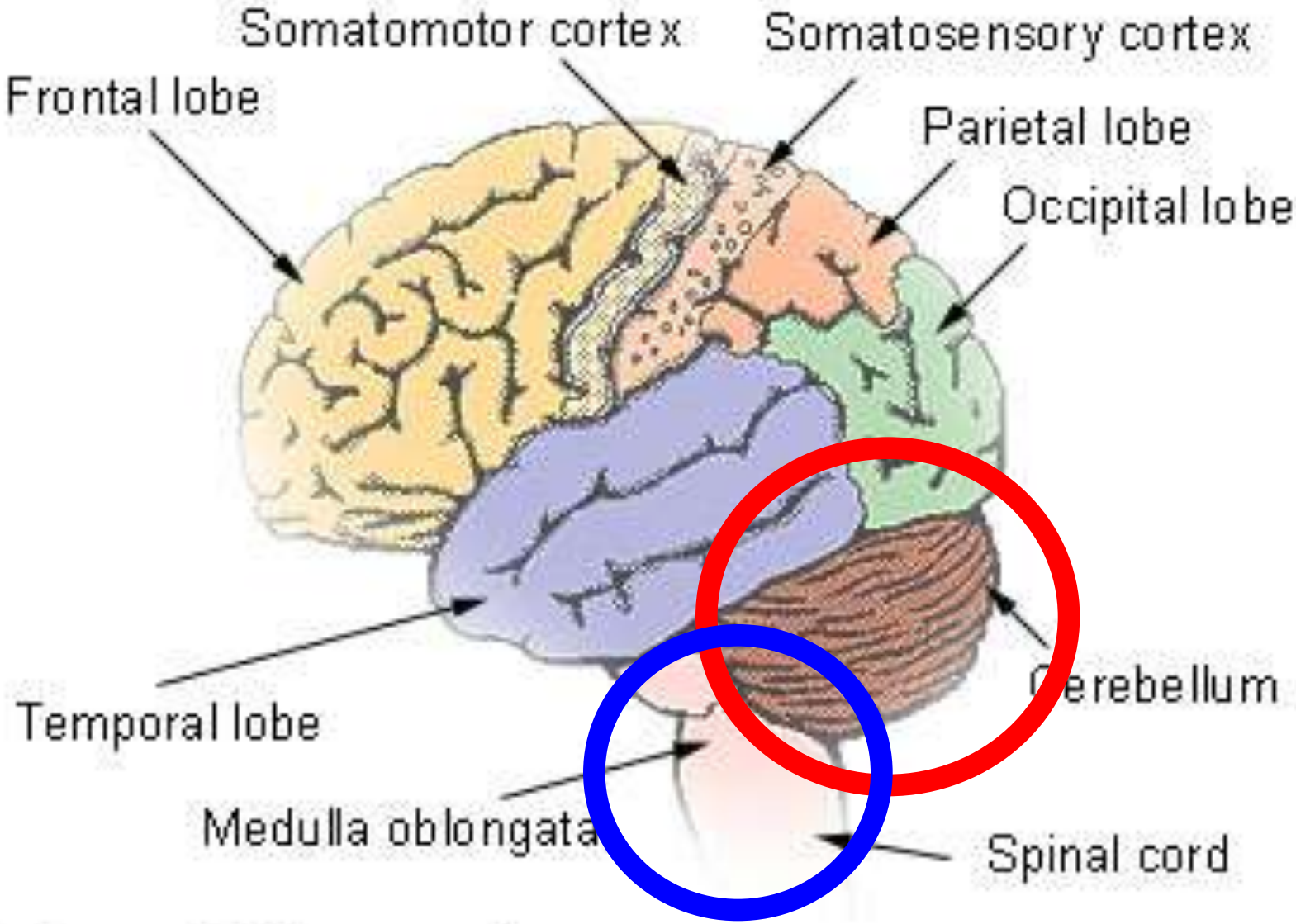
Posterior Circulation
Vertebral and Basilar Arteries

Coordination

Damage to the cerebellum

Clumsiness is on the same side as the stroke

Posterior circulation strokes can be exceedingly dangerous



Lobes of the cerebrum

Summary

- **Neuroanatomy allows for localization, which allows us to**

  Locate the stroke

  Predict the likely type of stroke

  Reconstruct the likely cause of stroke

  Determine acute treatment

  Project likely prognosis