



ENCEPHALOPATHY

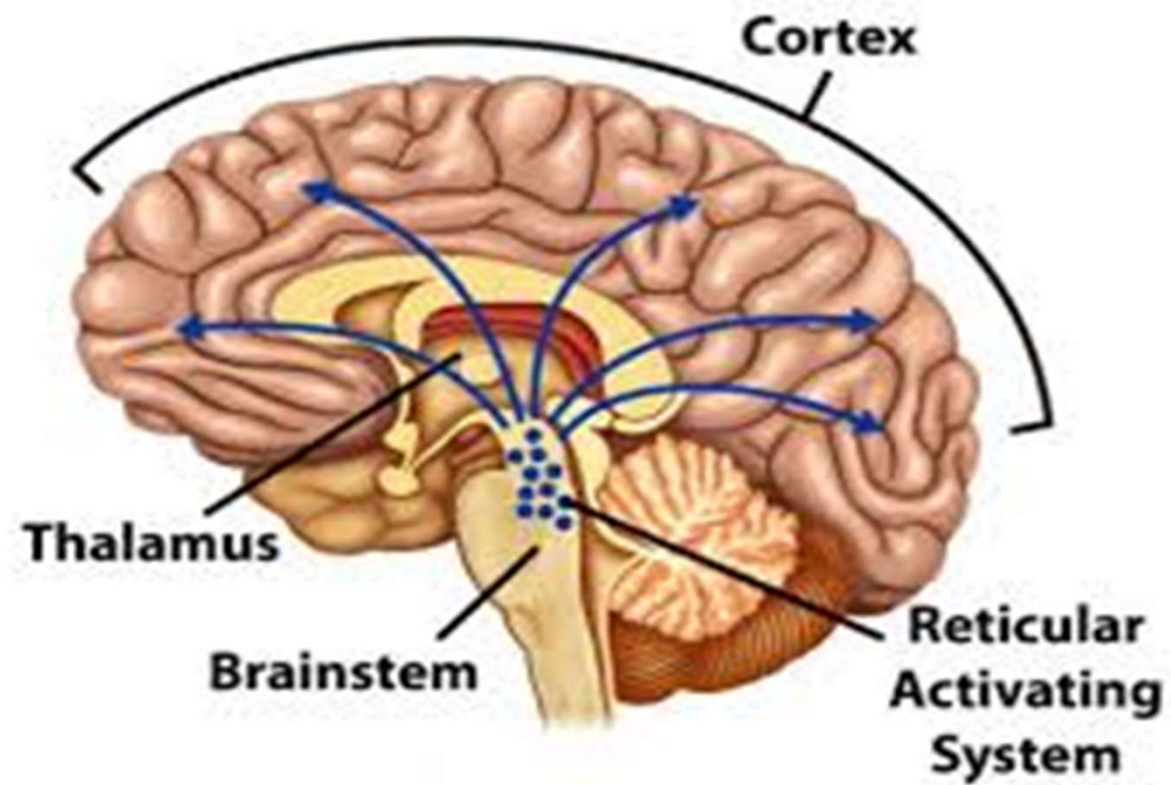
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Agenda

- Definition
- Staging
- Etiology
- Evaluation
- Treatment



- Consciousness defined as having two components: **awareness and arousal**.
- **Arousal**, also called **wakefulness**, refers to the level of alertness (clinically determined by eye opening), whereas awareness refers to the content of consciousness (clinically determined by the obeying of commands or nonreflex motor behavior such as eye tracking or localized responses to pain)

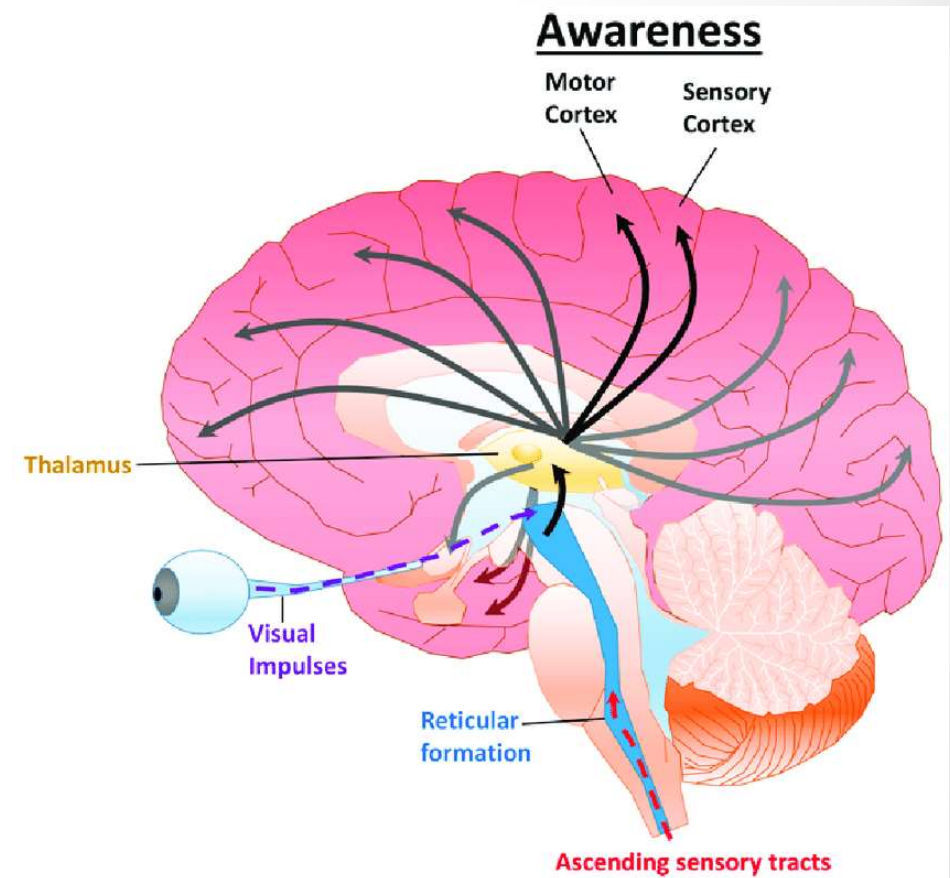
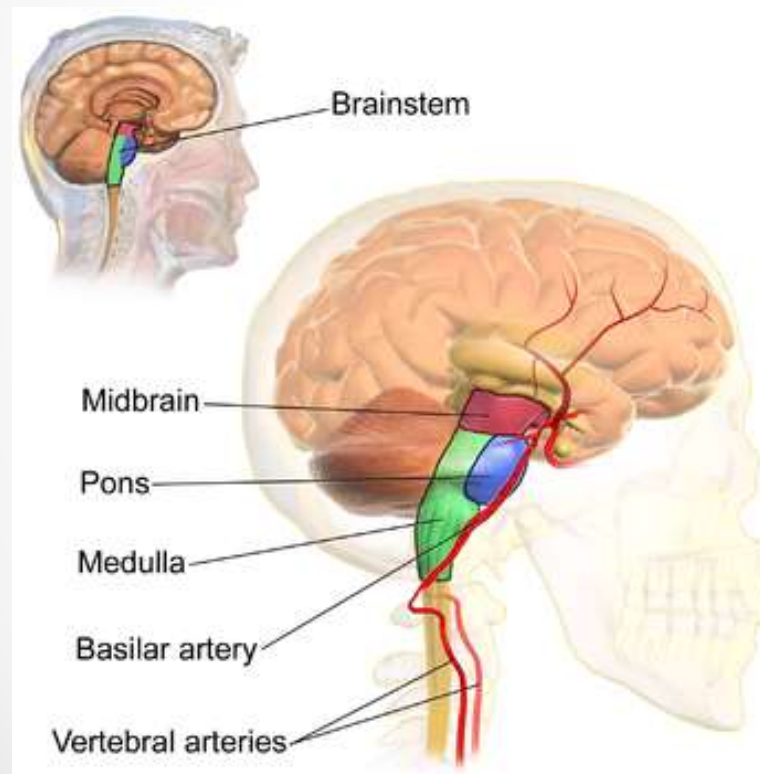


awareness

Frontoparietal & thalamus

Arousal

brainstem and hypothalamus



Encephalopathy

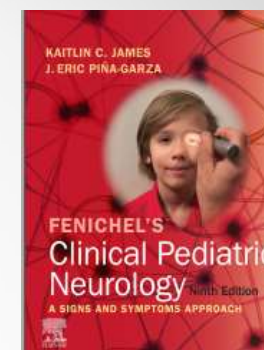
a **generalized disorder of cerebral function** that may be **acute or chronic, progressive or static**.

The etiologies of the encephalopathies in children include infectious, toxic (carbon monoxide, drugs, lead), metabolic, genetic, and ischemic causes. Hypoxicischemic encephalopathy

- The term encephalopathy describes a diffuse disorder of the brain in which altered states of **consciousness**, altered **cognition or personality**, and **seizures** may occur.

HISTORICAL PERSPECTIVE

- The **Edwin Smith** Surgical Papyrus (circa 1700 BC) is the oldest historical document to use the term “brain”.
- The French mathematician, physicist, and philosopher, **René Descartes** (1596–1650), associated the mind with consciousness and self-awareness and distinguished the mind from the brain



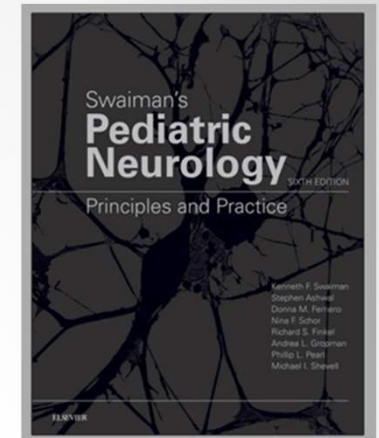
States of Decreased Consciousness

Term	Definition
Lethargy	Difficult to maintain the aroused state
Obtundation	Responsive to stimulation other than pain ^a
Stupor	Responsive only to pain ^a
Coma	Unresponsive to pain

^aResponsive indicates cerebral alerting, not just reflex withdrawal.

Glasgow Coma Scale and Pediatric Glasgow Coma Scale

Sign	Glasgow Coma Scale ^[1]	Pediatric Glasgow Coma Scale ^[2]	Score
Eye opening	Spontaneous	Spontaneous	4
	To command	To sound	3
	To pain	To pain	2
	None	None	1
Verbal response	Oriented	Age-appropriate vocalization, smile, or orientation to sound, interacts (coos, babbles), follows objects	5
	Confused, disoriented	Cries, irritable	4
	Inappropriate words	Cries to pain	3
	Incomprehensible sounds	Moans to pain	2
	None	None	1
Motor response	Obeys commands	Spontaneous movements (obeys verbal command)	6
	Localizes pain	Withdraws to touch (localizes pain)	5
	Withdraws	Withdraws to pain	4
	Abnormal flexion to pain	Abnormal flexion to pain (decorticate posture)	3
	Abnormal extension to pain	Abnormal extension to pain (decerebrate posture)	2
	None	None	1
Best total score			15



- Clouding of consciousness
- Confusion
- Impairment of Consciousness With Activated
- Mental State
- Impairment of Consciousness With Reduced
- Mental State
- Vegetative State
- Minimally Conscious State
- Locked-in Syndrome
- Akinetic Mutism
- Brain Death

- **Coma** is produced by diseases or conditions that cause **bilateral** cerebral cortical dysfunction, ascending reticularactivating system dysfunction, or both.

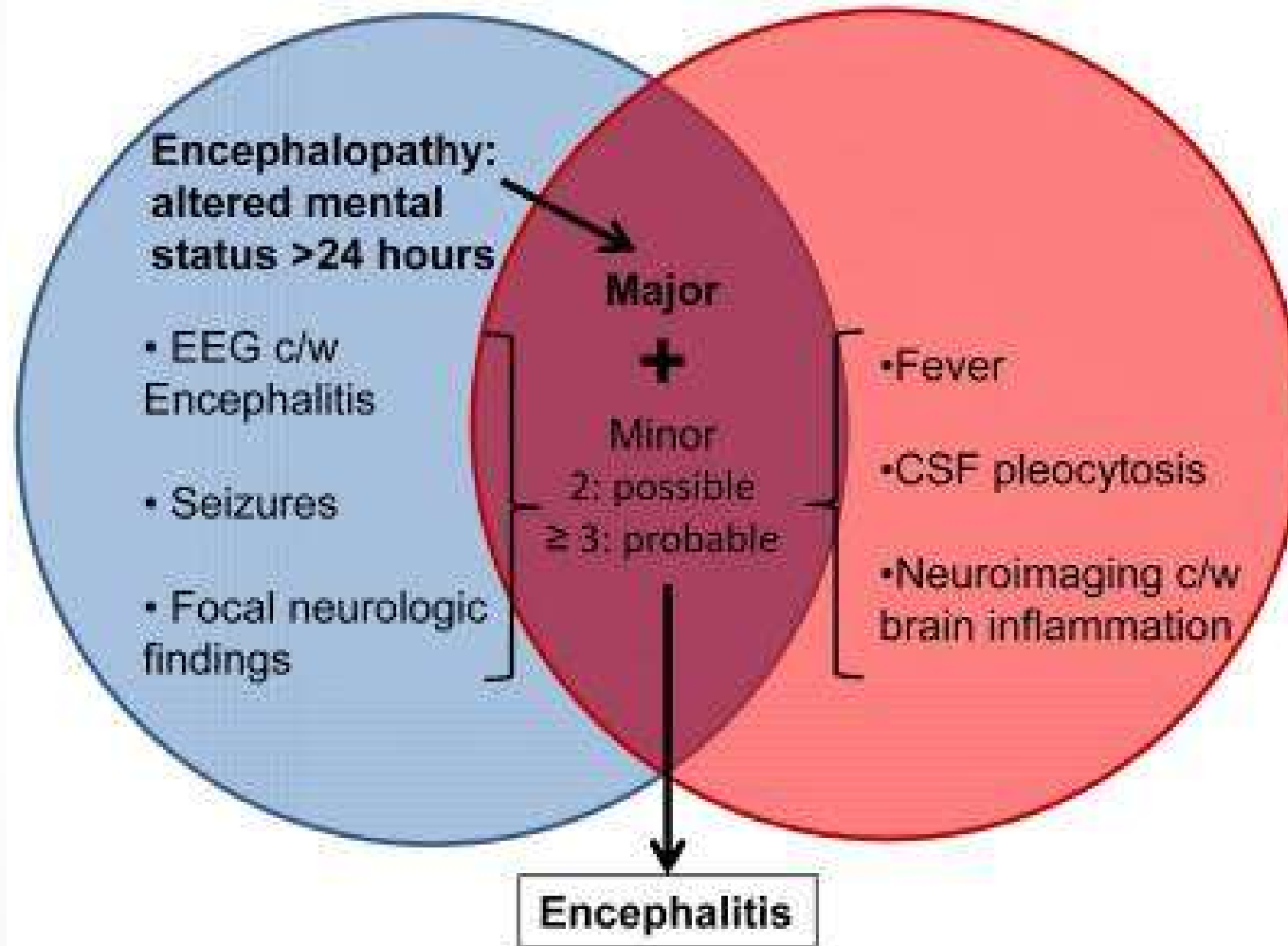


COMA

Subdivision

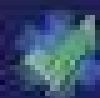
- (1) Metabolic, toxic, or infectious encephalopathies that diffusely affect the cerebral hemispheres, RAS or both
- (2) Supratentorial mass lesions that compress or displace the diencephalon or brainstem
- (3) Subtentorial mass or destructive lesions that compress or damage the RAS
- (4) Traumatic, hypoxicischemic, or metabolic axonal injury that affects both cerebral hemispheres, RAS, or their interconnections.

Neurologic Dysfunction + Brain Parenchymal Inflammation



ETIOLOGY

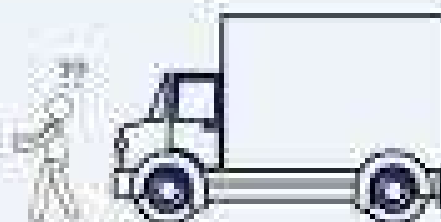
- Epilepsy
- Hypoxia-Ischemia
- Increased Intracranial Pressure
- Infectious Disorders
- Metabolic and Systemic Disorders
- Migraine coma
- Trauma
- Toxic
- Vascular



EMS MNEMONICS

What can cause
ALTERED MENTAL STATUS?

MOVE, STUPID!



M – Metabolic

O – Oxygen

V – Vascular

E – Endocrine

S – Seizures

T – Trauma

U – Uremia

P – Psychiatric

I – Infectious

D – Drugs, alcohol

ETIOLOGY

(practical classification)

- Infectious or inflammatory
- Structural
- Metabolic, toxic, or nutritional

Causes of Recurrent Encephalopathy

- Burn encephalopathy
- Epileptic encephalopathies^a
- Hashimoto encephalopathy^a
- Hypoglycemia^a
- Increased intracranial pressure^a (recurrent)
- Recurrent acute demyelinating encephalomyelitis^a (ADEM)
- Medium-chain acyl-coenzyme A dehydrogenase deficiency
- Psychiatric disorders
- Migraine
- Mitochondrial disorders
- Pyruvate metabolism disorders
- Substance abuse
- Urea cycle disorder

EVALUATION

evaluate the evolution of symptoms

Clinical Evaluation

Identification of Cause

History

General Physical Examination

Neurologic Examination



History

Sudden onset : convulsions or ICH , cardiac

sleepiness or unsteadiness : ingestion of drug or toxin

Fever : infection, ADEM , metabolic

headache : IICP , Neoplasm , migraine

Trauma : DAI



- evaluation of accidental versus nonaccidental trauma
- diabetes: Hypoglycemia
- current medications
- CHD : brain abscess or infarction
- carbon monoxide poisoning

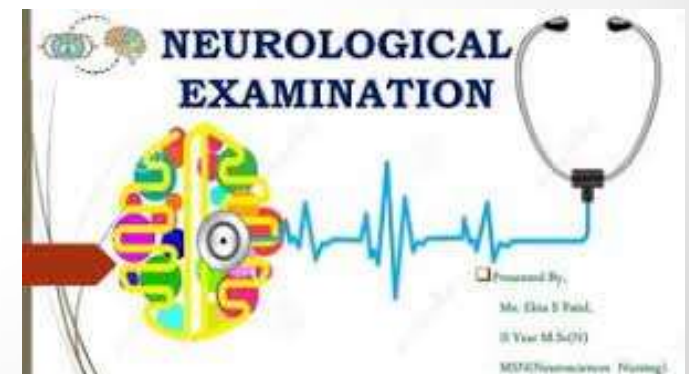


- **General Physical Examination**
- vital signs
- Rapid respiration
- Hypotension
- Hypertension
- breathing patterns
- Cyanosis /pigmentation
- Jaundice/pallor
- cherry-red color
- odor of exhaled breath
-

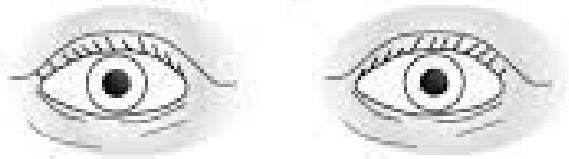


Neurologic Examination

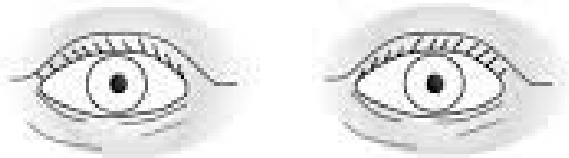
- state of consciousness
- pattern of breathing
- pupillary size and reactivity
- eye movements
- motor responses
- oculoccephalic maneuver
- The corneal reflex
- meningeal signs



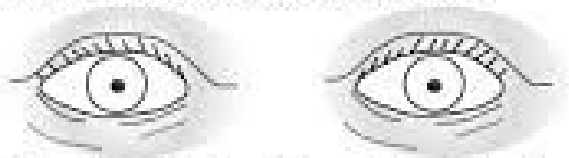
Normal: equal, round, reactive



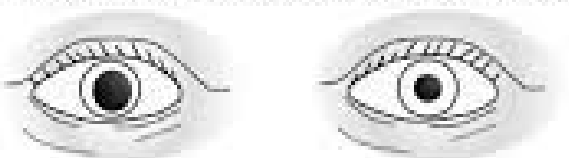
Thalamic Lesion: small, reactive



Pontine Lesion: pinpoint, unreactive

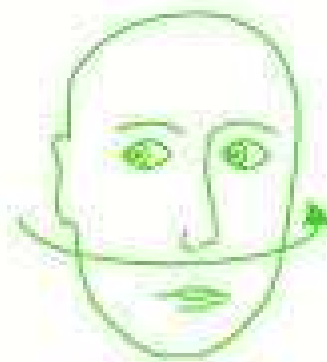


Transtentorial Herniation: unilateral fixed and dilated



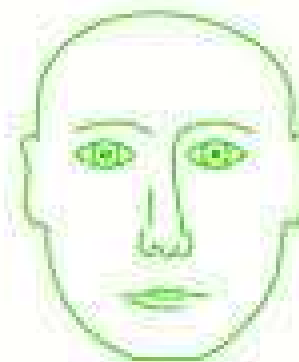
Oculocephalic (Doll's eye)

Head to left



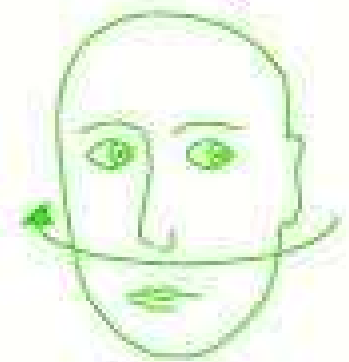
Eyes to right

Central

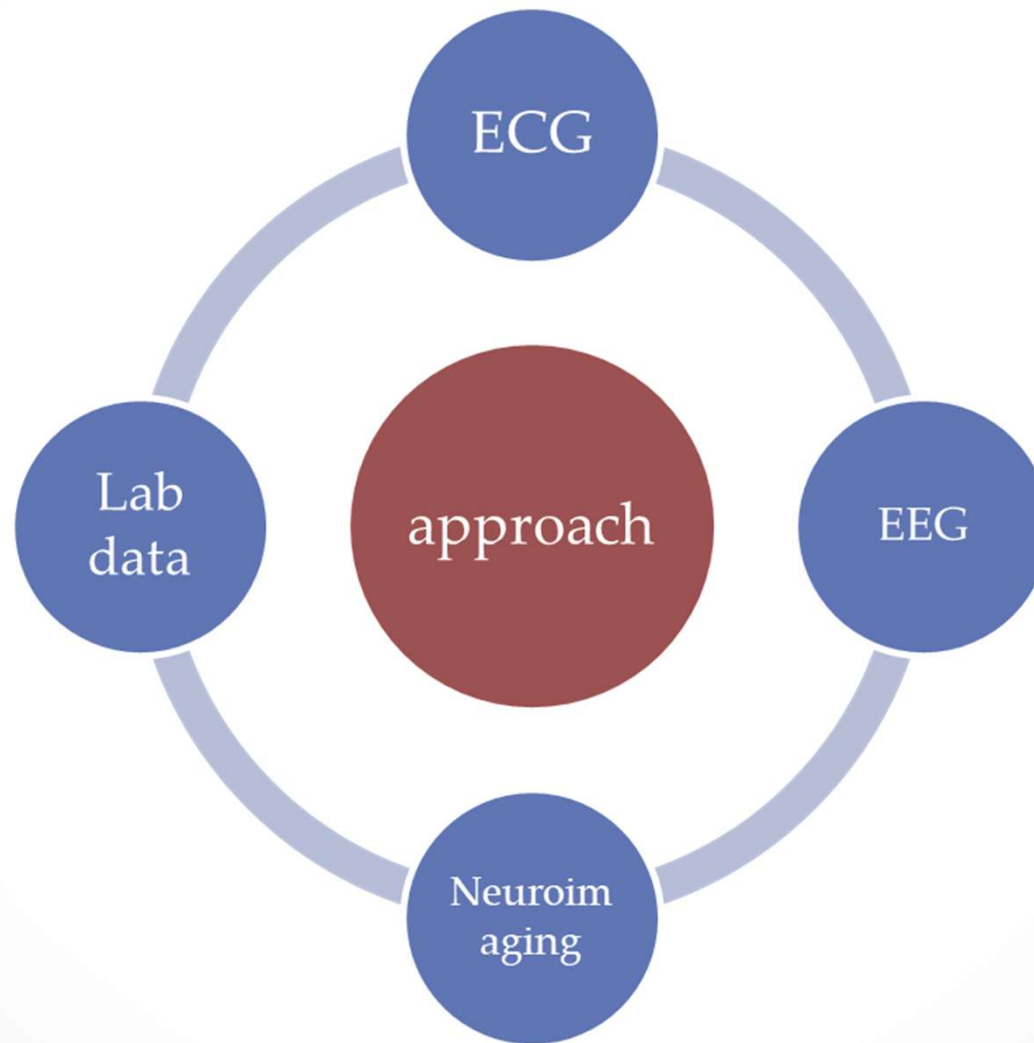


A normal
response

Head to right



Eyes to left



Laboratory Testing

- Serum electrolytes
- calcium, magnesium, glucose
- Arterial blood gas
- Liver function tests
- TFT
- Ammonia
- CBC / ESR / CRP

- BUN, creatinine
- Urine drug screen
- Blood culture
- PT/PTT/INR
-

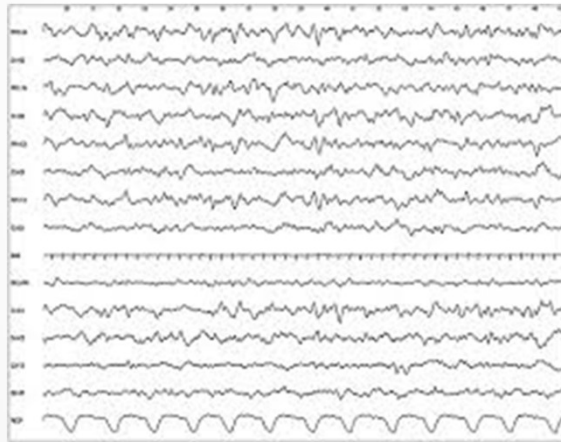


Neuroimaging

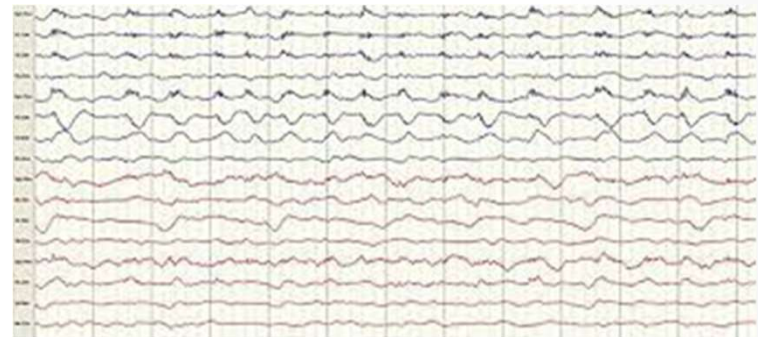
- Brain CT scan
- Brain MRI

EEG

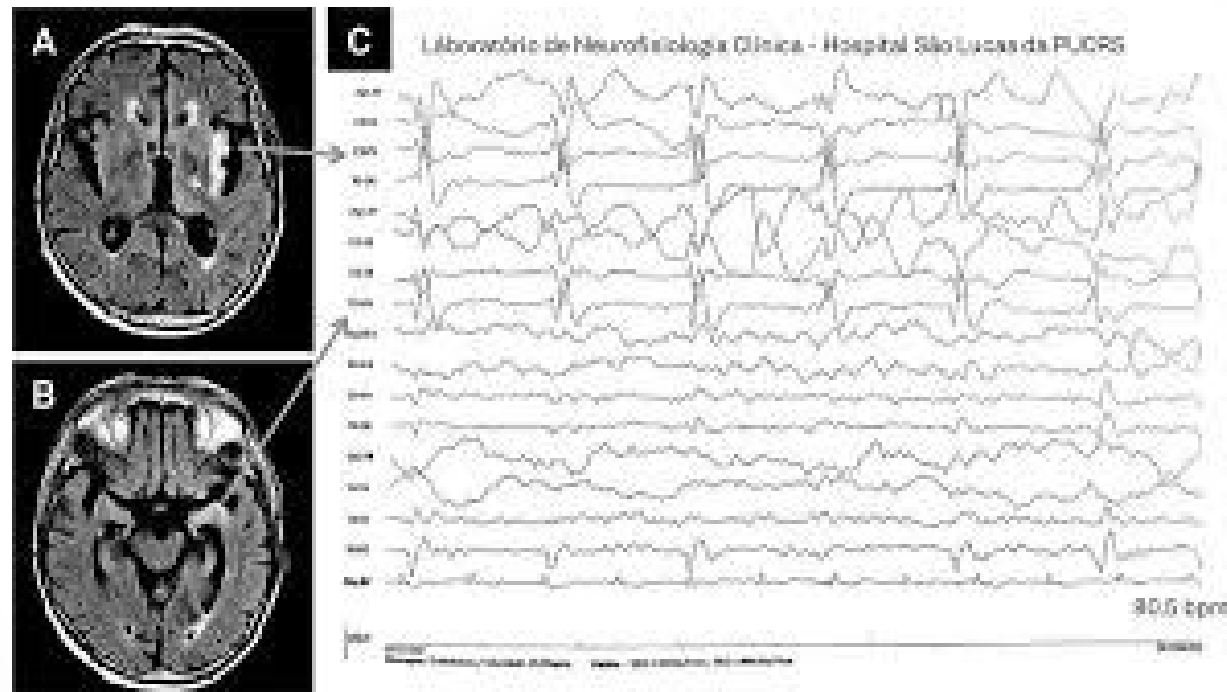
normal



encephalopathy



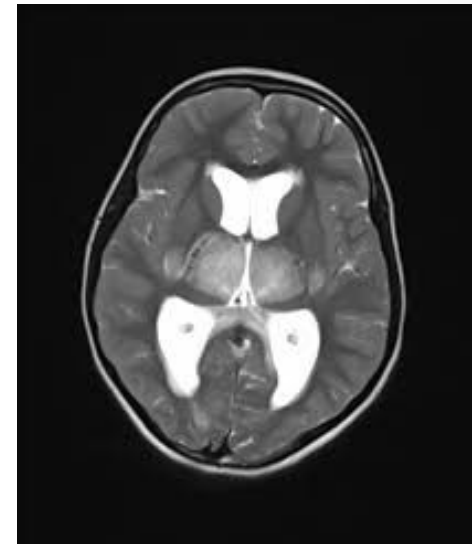
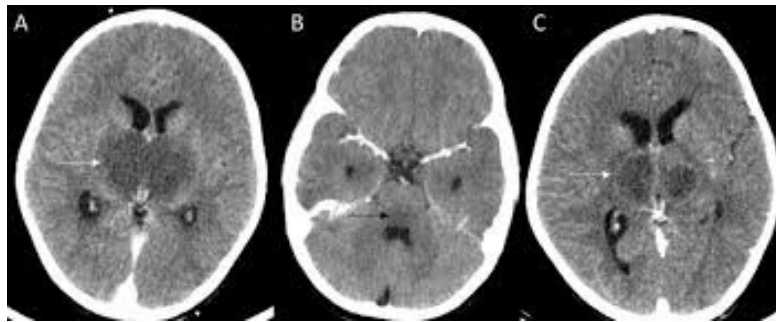
EEG in HSV encephalitis



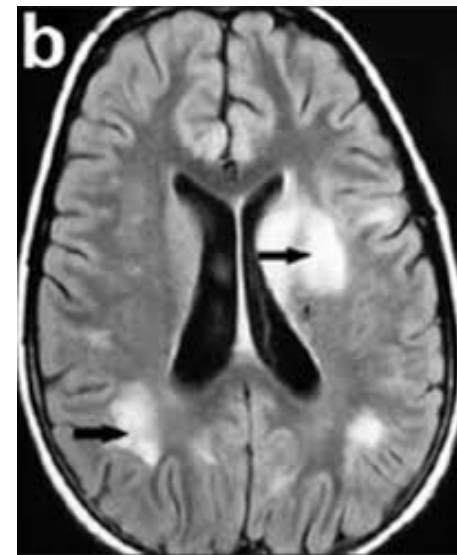
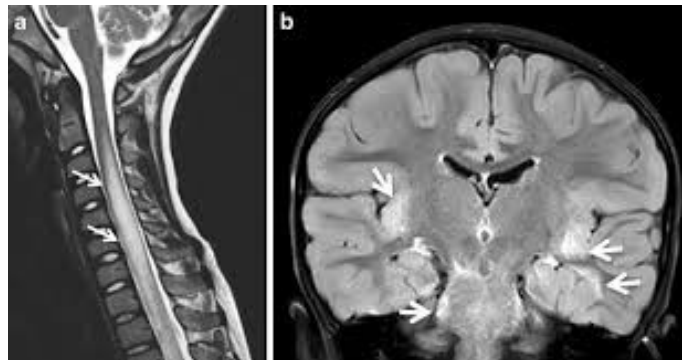
ICH



Acute necrotizing encephalopathy of childhood



ADEM



TREATMENT

BOX 101-4 Treatment Goals for Patients With Impaired Consciousness and Coma

- Ensure oxygenation
- Maintain circulation
- Give glucose
- Correct acid–base and electrolyte imbalance
- Consider specific antidotes
- Reduce increased intracranial pressure
- Stop seizures
- Treat infection
- Adjust body temperature
- Manage agitation



THANKS

take care of your brain

