

# Coma and syncope

By:

- **Sara Ma'rouf:** Coma definition and causes.
- **Mays Al-shayeb:** GCS, brain death and vegetative state.
- **Ro'a Abo Fares:** Approach unconscious patient (Hx&PE).
- **Ali Boabbas:** coma management.
- **Ahmad boabbas:** syncope definition and causes.
- **Tasneem Hussein:** intervention and management for





# Coma

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# Coma

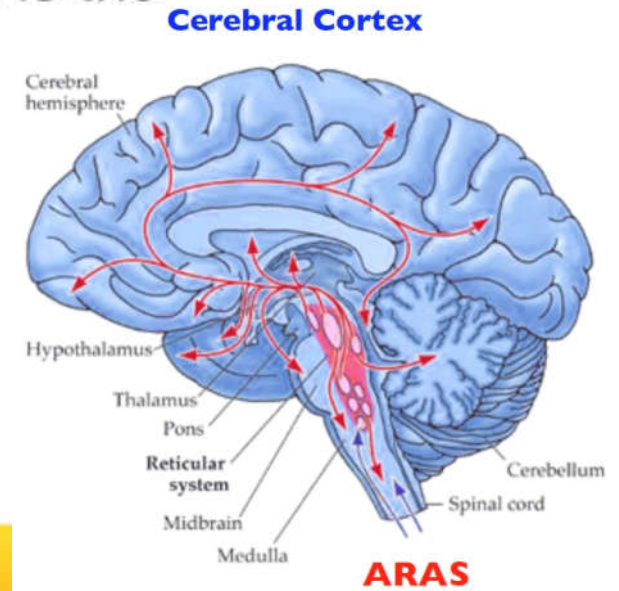
## DEFINITION

- Coma is a state in which a patient is unresponsive to environmental stimuli and unable to communicate in any manner. Coma is associated with extensive structural or physiologic damage to both cerebral hemispheres or to the ascending RAS (reticular activating system) in the diencephalons, mesencephalon, or pons.

## The state of consciousness or alertness depends on:

1-An intact reticular activating system (R.A.S.): This is a collection of nuclei present in the brain stem, hypothalamus & thalamus. It receives impulses from the pathways carrying sensations from the outside world & transmits them through ascending fibres to the cerebral cortex. Its function is the activation of the cerebral cortex

2-An intact cerebral cortex.



So, small lesion of ARAS OR massive lesion CC = Coma

# Etiology

## 1-INTRACRANIAL CAUSES

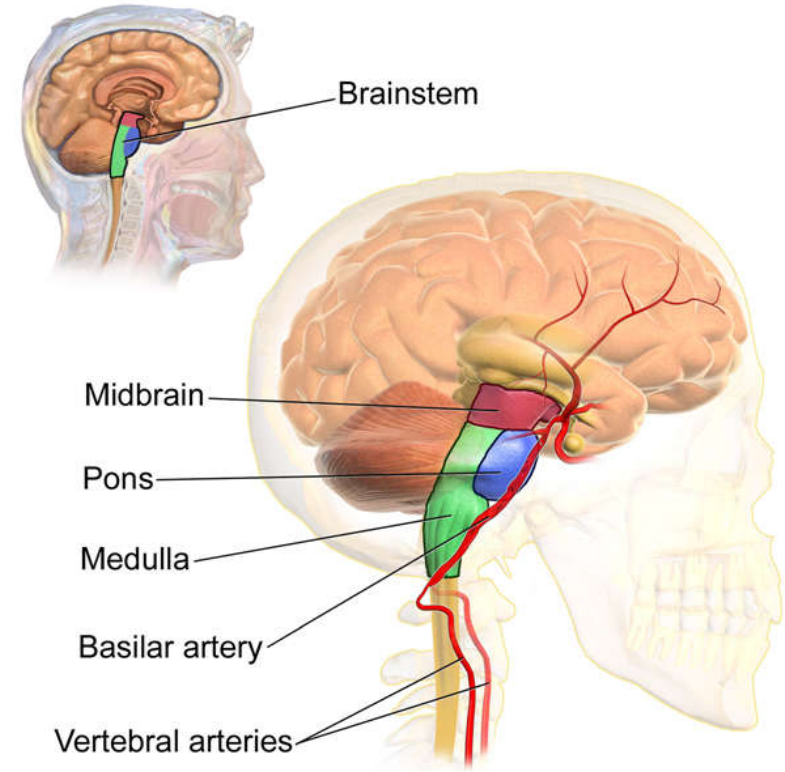
"Local causes in the brain"

\*\*\*Coma **with lateralising** signs

### THE SIGNS OF LATERALISATION ARE:

- ✓ *UNEQUAL PUPILS.*
- ✓ *DEVIATION OF THE EYES TO ONE SIDE*
- ✓ *FACIAL ASYMMETRY*
- ✓ *TILTING OF THE HEAD TO ONE SIDE:*
- ✓ *UNILATERAL HYPO- OR HYPERTONIA.*
- ✓ *ASYMMETRIC DEEP REFLEXES.*
- ✓ *UNILATERAL + VE BABINSKI*
- ✓ *Unilateral focal or Jacksonian fits.*

- \*. **Trauma** : head injury with cerebral concussion
- \*. **Tumor** : brain tumor e.g. meningioma
- \*. **vascular** : Hemorrhage (Cerebral & subarachnoid), thrombosis, embolism, Hypertensive encephalopathy.
- \*. **Inflammatory** : meningitis, encephalitis, brain abscess
- \*. **epilepsy**



## 2 **-EXTRACRANIAL CAUSES**

\* General causes with 2ry effects on the brain"

\*\*\*Coma **without** lateralising signs

### \*. Toxic:

- ✓ *Belladonna (atropine) poisoning,*
- ✓ *Aspirin (salicylate) poisoning,*
- ✓ *Alcohol intoxication,*
- ✓ *Barbiturate poisoning,*
- ✓ *Carbon monoxide poisoning,*
- ✓ *Morphine (opiate) poisoning,*

\*. **Hypoxic:** Pulmonary disease.

\*. **Cardiac auses:** cardiac arrest ,MI ,arrhythmia ,Hypotensive drugs.

\*. **Metabolic:** Hypo & hyperglycemia (D.M.), Hypo & hyperthermia (heat stroke), Respiratory failure, Renal failure, Hepatic failure.

\*. **Endocrine:**

- ✓ *PITUITARY: Hypopituitarism.*
- ✓ *THYROID: Hypothyroidism & thyrotoxic crisis.*
- ✓ *ADRENAL: Addisonian crisis*

\*. **Fever** (febrile coma) // **Infections:**

Meningitis

Malaria, especially the Cerebral type

Status typhosus.

Septicemia

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## **CAUSES OF FEBRILE COMA:**

- 1. Infective: encephalitis, meningitis & other hyperpyrexias.**
- 2. Vascular: pontine hemorrhage, subarachnoid haemorrhage.**
- 3. Metabolic: diabetic ketoacidosis, hepatic cirrhosis.**
- 4. Endocrinal: thyrotoxic & Addisonian crisis.**
- 5. Toxic: Belladonna & salicylate poisoning.**
- 6. Sun stroke & heat stroke.**
- 7. Coma with 2ry infection due to hypostatis pneumonia, U.T, infection or bed sores.**



# Glasgow coma scale (GCS)



## **What is Glasgow coma scale?**

It is a neurological scale used to reliably measure a person's level of consciousness after a [brain injury](#).

Developed by University of Glasgow in 1974.

## **Why is it important?**

Any change in Level of consciousness (LOC) is always the first sign that appears on your patient and GCS can detect that.

### 3 brain levels that are assessed by GCS:

1. Cortex: where many of the higher-level functions take place (e.g. decision-making and language).
1. Subcortical: where we process more primitive functions.
1. Brain stem: where basic (almost reflex like) responses in our body.



\*\* if the damage reached the brain stem and altered its function    severe brain damage.

## Glasgow coma scale assessment:

Based on the persons ability to perform eye movements, speak, move their body.

The highest score one can get on GCS is 15 which means that there is no brain damage.

The lowest score one can get is 3.

GLASGOW COMA SCALE		
EYE OPENING	VERBAL RESPONSE	MOTOR RESPONSE
		
Spontaneous → 4	Orientated → 5	Obey commands → 6
To sound → 3	Confused → 4	Localising → 5
To pressure → 2	Words → 3	Normal flexion → 4
None → 1	Sounds → 2	Abnormal flexion → 3
	None → 1	Extension → 2
		None → 1
GLASGOW COMA SCALE SCORE		
Mild 13-15	Moderate 9-12	Severe 3-8

# 4 steps when assessing the patient...

## 1) Check:

If there is any factors that may interfere with your assessment.

If there is any hearing impairment that will cause difficulty in communication.

## 2) Observe:

any spontaneous movements.

## 3) Stimulate:

sites of physical stimulation are fingertip pressure (peripheral), trapezius pinch and supraorbital notch (central).

## 4) Rate:

15 fully conscious.

13-15 Mild brain damage.

9-12 Moderate damage.

3-8 Severe damage. (High chance of being in a coma)

**The first criteria is eye opening:**

**Highest score is 4 lowest is 1**

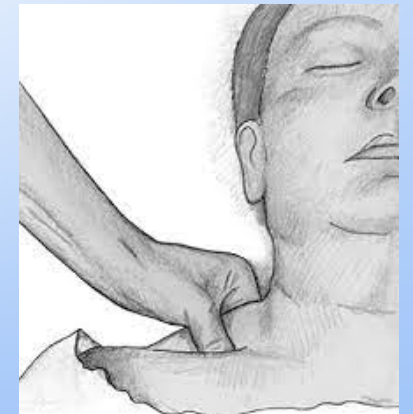
This starts as soon as you enter the room **if** the patient open their eyes spontaneously then it is a 4.

**If** they didn't try calling their name, quietly first then raise your voice. If they open them then it's a 3.

**If** not yet try pressuring their nail bed for 10 seconds or pinch the trapezius, if they open their eyes then it is a 2.

**If** they didn't open them at all even after all of this, then it is a 1.

**If the patient cannot open their eyes for some reason (e.g: Edema, trauma, dressings) you should document that the test is non testable "NT".**



- (4) Points      spontaneous eye opening.
- (3) Points      eye opening to sound.
- (2) Points      eye opening to pressure.
- (1) Points      no eye opening.
- (NT)      if there is a local factor that prevent eye opening.

<b>Eye response</b>	
Eyes open spontaneously	4
Eye opening to verbal command	3
Eye opening to pain	2
No eye opening	1

## **Verbal response:**

### **Higher score is 5**

Ask the patient about their name and where are they? What month or year is it? **If** they answered these three questions correctly then it is a (5).

**If** they looked confused and starting talking and gave you full meaningful sentences but they are not related to your questions, then it is a (4).

**If** they gave you meaningless words that does not make any sense it is a (3) then.

**If** they started making sounds without words, then it is a (2).

**If** no verbal response (1)

**If** the patient can't talk (deaf and mute, intubated) then you write on the test (NT).



- (5) Points      oriented to person, place and time.
- (4) Points      confused –proper sentences but not related to the subject-
- (3) Points      words
- (2) Points      sounds
- (1) Points      no verbal response
- (NT)      if there is a local factor that affect the test.

<b>Verbal response</b>	
Oriented	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
No verbal response	1

## **Motor response:**

### **Highest score is 6**

Ask the patient to do a 2 steps action (like open their mouth and stick out their tongue or grasp and release your fingers with their hand) **If** they obey your orders then it is a (6).

**If** they didn't obey then central pain stimuli is needed (trapezius pinch, supraorbital notch) for 10 seconds.

**If** the patient moved their arm to the place of stimulation and moved your arm away, then it is a (5).

**If** they withdrew (moved their body away from the pain) then it is a (4).

**If** they moved their arms to their chest (decorticate posture) then it is a (3).

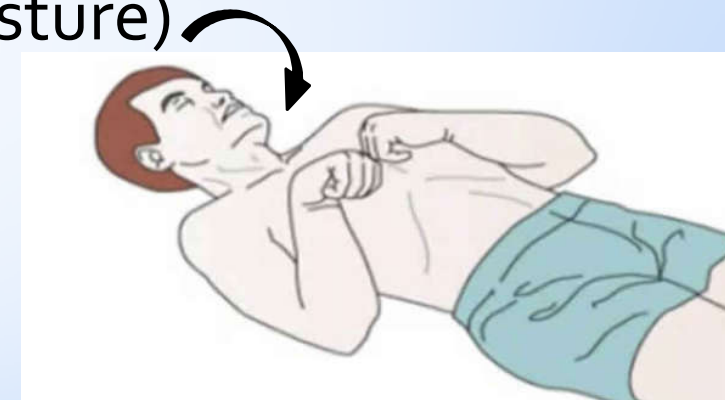
**If** they extended their elbow other than flexing it (Decerebrate posture), you give it (2).

**If** you didn't see any movement then it is a (1).

**If** the patient is paralyzed and cant move you must note that, and it becomes (NT).



- (6) Point obey commands.
- (5) Points Localizing (move their arms to the site and move your arm).
- (4) Points Withdraw to pain.
- (3) Points Abnormal flexion (decorticate posture)
- (2) Points extension (decerebrate posture)

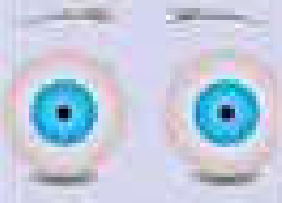




- (1) Points no motor response.
- (NT) patient is paralyzed.

<b>Motor response</b>	
Obeys command	6
Localises pain	5
Withdraws from pain	4
Flexion response to pain	3
Extension response to pain	2
No motor response	1

E.g: your patient opened their eyes to verbal stimulation, responded with incomprehensible sounds and withdraw to the pain you stimulated.

E:3, V:2, M:4 = 10

Behaviour	Response
 Eye Opening Response	<ol style="list-style-type: none"><li>4. Spontaneously</li><li>3. To speech</li><li>2. To pain</li><li>1. No response</li></ol>
 Verbal Response	<ol style="list-style-type: none"><li>5. Oriented to time, person and place</li><li>4. Confused</li><li>3. Inappropriate words</li><li>2. Incomprehensible sounds</li><li>1. No response</li></ol>
 Motor Response	<ol style="list-style-type: none"><li>6. Obeys command</li><li>5. Moves to localised pain</li><li>4. Flex to withdraw from pain</li><li>3. Abnormal flexion</li><li>2. Abnormal extension</li><li>1. No response</li></ol>

## **GCS problems:**

1. It won't give you the complete picture about the patient's case, you should run further more specific complex neurological testing to know the causes. But it is important to see LOC giving that it's the first thing changing in case of damage.
2. Single score doesn't give you the complete picture, assess the patient more than one time.
3. If you're dealing with a patient that is intubated the highest score they are going to get is 11 because they can't, give any verbal response (V1).
4. If your patient is sedated, they will score very low even if there is no brain damage.

# Brain death



- It is a complete loss of brain function (including involuntary activity necessary to sustain life).
- Irreversible brain damage may have occurred with permanent destruction of brainstem function (total lack of vital signs “heartbeat and respiration”).
- No response to pain and no cranial nerve reflex including papillary response (fixed pupils), oculoccephalic reflex (doll head eye), corneal reflex, no response to the caloric reflex test, and no spontaneous respiration.
- Patients classified as brain-dead can have their organs surgically removed for organ donation.

### **Diagnosis:**

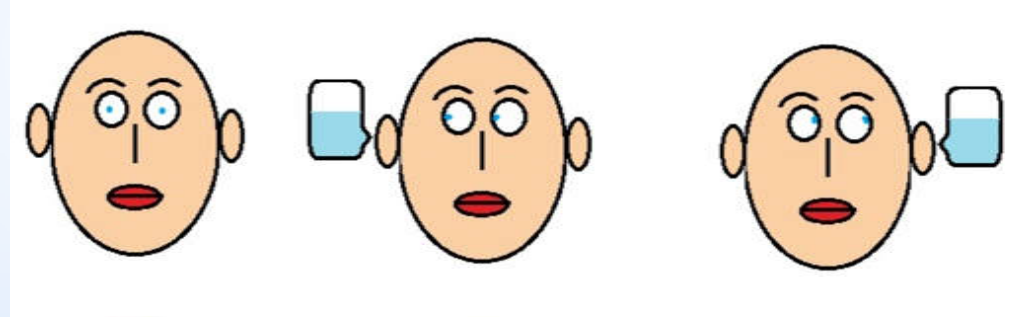
1. A person must be unconscious and fail to respond to outside stimulation.
2. A person heartbeat and breathing can only be maintained using a ventilator.
3. There must be clear evidence that serious brain damage has occurred, and it can't be cured.

### **Ruling out any other conditions:**

1. Overdose of illegal drugs, poisons or other chemical agents.
2. An abnormally low body temperature (<32).
3. Severe hypothyroidism.

## Test:

1. Torch is shone into both eyes to see if they react to light (pupillary response).
2. Stroke the eye with a tissue and see the reaction (corneal reflex), if absent brain death.
3. Insert something into the throat and look for pharyngeal contraction (gag reflex).
4. Ice-cold water is inserted into each ear, which would usually cause eyes to move to the same side (caloric reflex), absent in brain death.



1. Disconnect the person from the ventilator for a short period of time and see if they make any attempt to breathe on their own.

**Brain death is diagnosed if a person fails to respond to all these tests.**



Vegetative  
state



- A wakeful unconscious state (individual is unaware of self and environment), yet able to breath spontaneously (preserved brainstem function), with a stable circulation and cycles of eye closure and opening resembling sleep and waking.
- Also called **unresponsiveness wakefulness syndrome** it is not coma.
- This state may be permanent (after 4 weeks) the patient then is classified as in a persistent vegetative state.
- Someone in a vegetative state still has a functioning brain stem which means:
  - some form of consciousness may exist.
  - breathing unaided is usually possible.
  - there is slim chance of recovery because the brain stem cores function may be unaffected.

### **Causes:**

1. Disruption of blood flow to brain.
2. Severe head injury.
3. Drug overdose.
4. Stroke.

## Diagnosis:

- No evidence of awareness of self or environment.
- no purposeful and sustained response to stimuli.
- Presence of sleep-awake cycles.
- Presence of brain stem function and some reflexes.
- General incontinence.

**If a person in a vegetative state for a long time, it might be considered as:**

1. A continuing (persistent) vegetative state: when its been for more than 4 weeks.  
**Persistent vegetative state:** it is a disorder of consciousness in which patients with severe brain damage are in a state of partial arousal rather than true awareness.
2. A permanent vegetative state: when its been for more than 6 months if caused by a non-traumatic brain injury, or more than 12 months of caused by a traumatic brain injury.

**If a person is diagnosed with it, recovery is extremely unlikely but not impossible.**

# Locked in syndrome



- Also known as pseudo-coma.
- Damage of the pons → loss of all motor actions and most sensations of the body.
- Patient can't live without ventilator for breathing and any artificial feeding process.
- Where the function of the reticular activation system is preserved despite extensive brainstem damage. The patient is alert but paralyzed able to communicate with eye movements.
- Unlike the persistence vegetation state, in which the upper portion of the brain is damaged, and the lower portions are spared. Locked-in syndrome is caused by damage to specific portion of the lower brain and brainstem, with no damage to the upper brain.

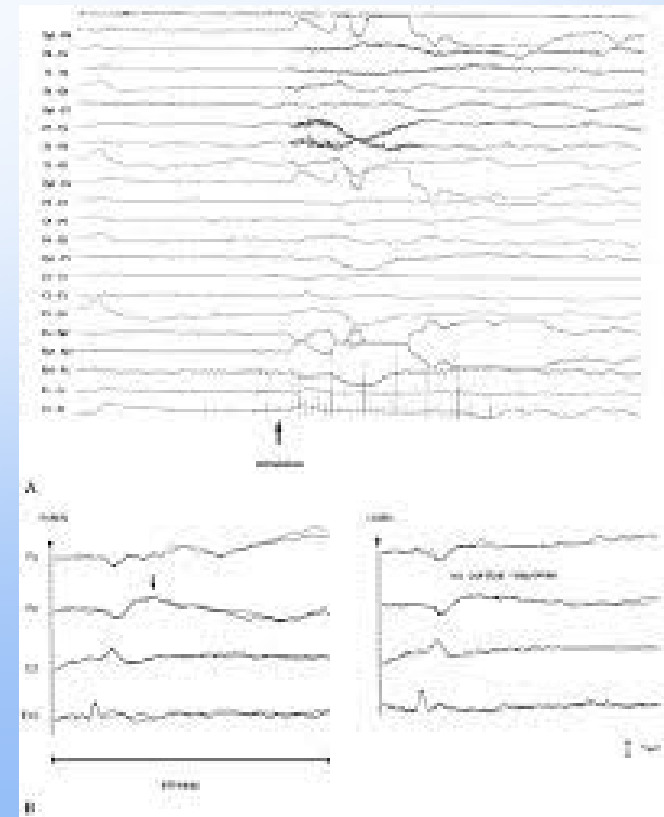
**Causes:**

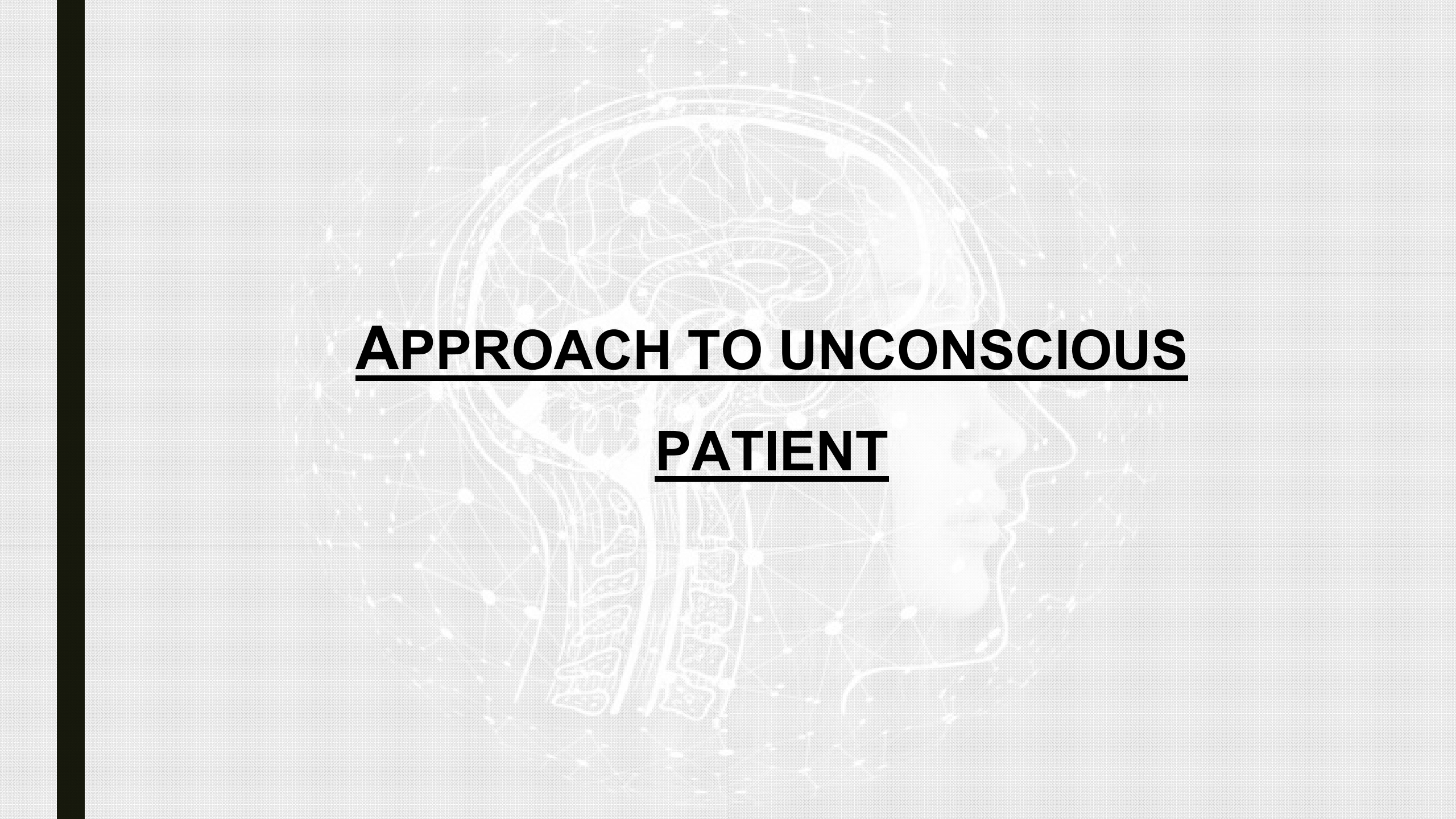
1. Heroin abuse.
2. Abscesses or tumors in the pons.
3. Toxins.

## Diagnosis:

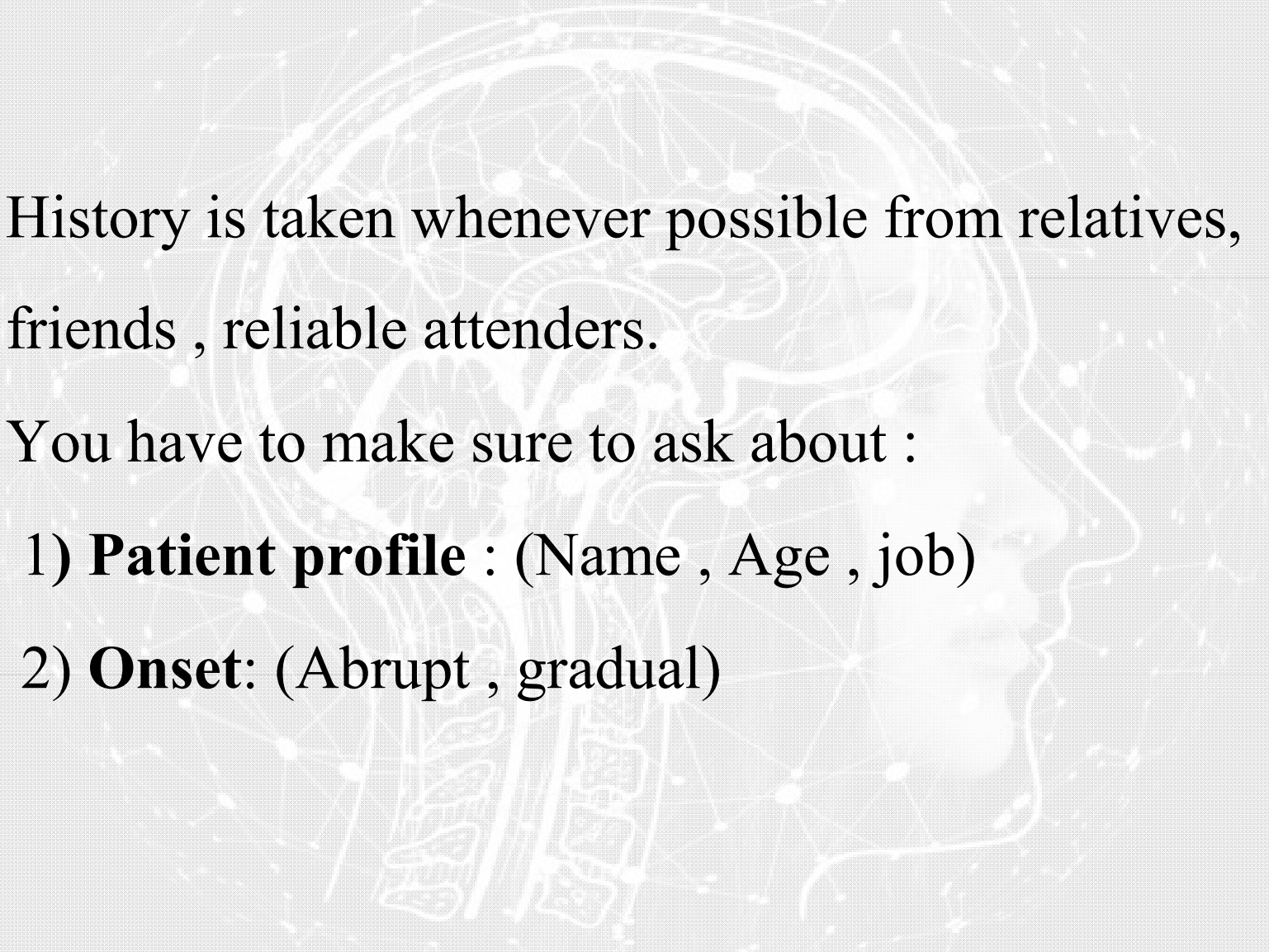
It is very difficult as most patients be in a coma prior to the locked in syndrome.

- Patient looks in a coma but with eye movement that is usually noticed by loved ones while talking to the patient.
- MRI and EEG are the definitive diagnostic tests.  
MRI will show the damaged areas of the pons and brain while the EEG shows normal brain activity.





**APPROACH TO UNCONSCIOUS**  
**PATIENT**



History is taken whenever possible from relatives, friends , reliable attenders.

You have to make sure to ask about :

- 1) **Patient profile** : (Name , Age , job)
- 2) **Onset**: (Abrupt , gradual)





\* Clarify the meaning of the terms used by the patients to describe their Sx.

\* Determine which parts of the body are affected by Pain, weakness or sensory loss

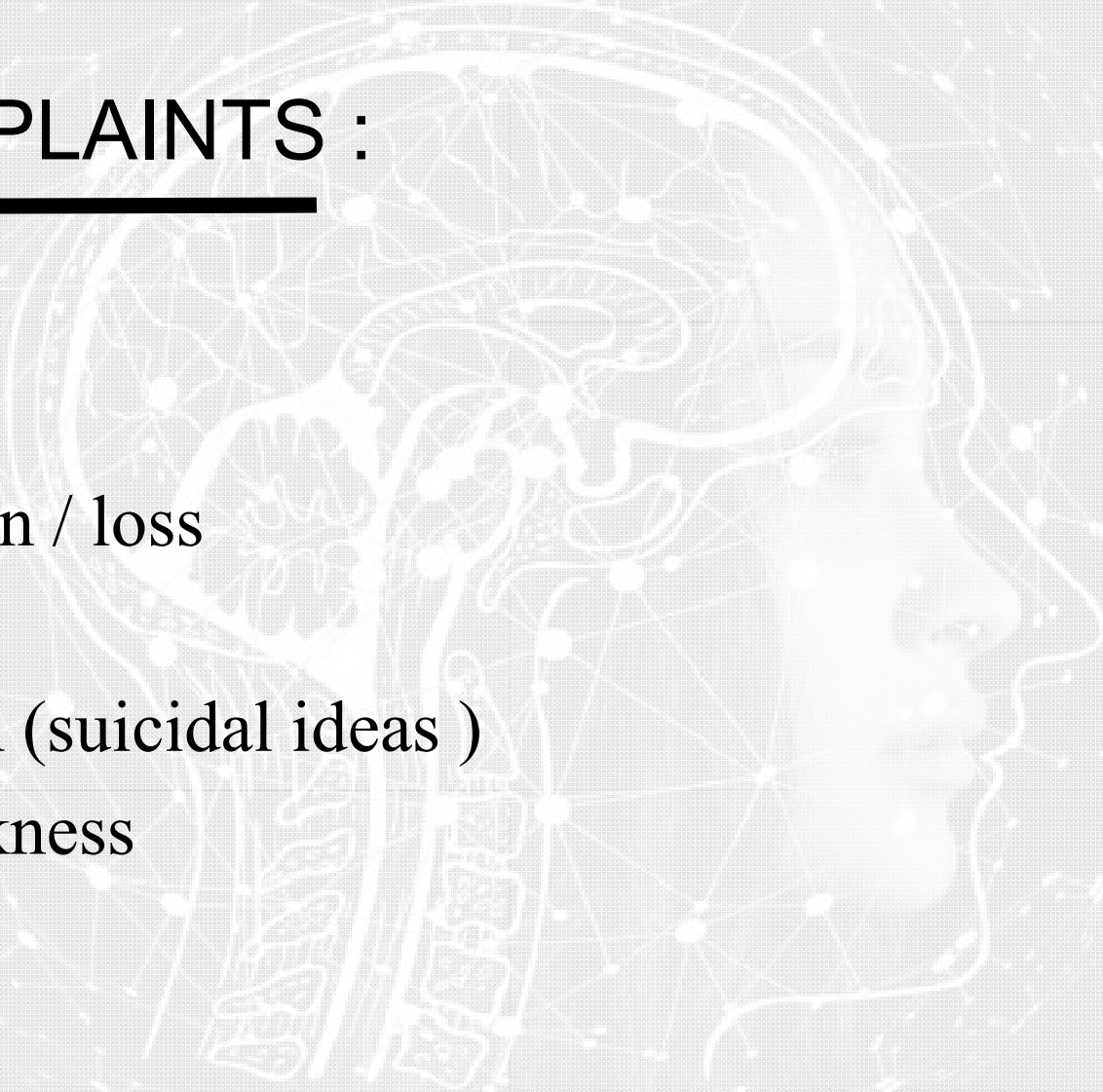
\* Be aware of terms :

- Blackouts
- Vertigo
- numbness

## RECENT COMPLAINTS :

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- Headache
- Weight gain / loss
- Fever
- Depression (suicidal ideas )
- Focal weakness
- Trauma



# PAST MEDICAL HISTORY



- DM
- Hypertension
- Chronic lung disease
- Renal failure
- Thyroid disease
- Heart disease

\*\* Note for any prev. neurological events

# DRUG HISTORY



- Prescription drugs
- Over the counter drugs
- Complementary drugs
- **Recreational drugs** is a loose term that refers to legal and illegal drugs that are used without medical supervision. There are four categories of recreational drugs: analgesics, depressants, stimulants, and hallucinogens
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# FAMILY HISTORY

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\* Ask for genetic Dx affect the nervous system :

- Neuropathies
- Ataxias
- Huntington's Dx
- Epilepsy
- M.S
- Vascular diseases
- HTN
- DM

# SOCIAL HISTORY

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- Ask for occupational factors relevant to neurological Dz.
- \* Exposure to toxins >> peripheral neuropathies
- Entrapment neuropathies
- Stress-related Sx & syndrome
  
- ^ Ask for marital status / any domestic violence?
- Smoking ?
- Alcohol and drug abuse
- Sexual history ? ( for syphilis & HIV)

# GENERAL EXAMINATION

## 1) **Temperature:**

- ❑ Hyperthermia : causes of febrile coma
- ❑ Hypothermia
- ❑ Hypopituitarism
- ❑ Hypothyroidism
- ❑ Barbiturate
- ❑ alcohol



## 2) **Pulse**

- Bradycardia: brain tumors, opiates, myxedema.
- Tachycardia: uremia

## 3) **Blood Pressure**

- High: hypertensive encephalopathy
- Low: Addisonian crisis, alcohol



## 4. Respiration

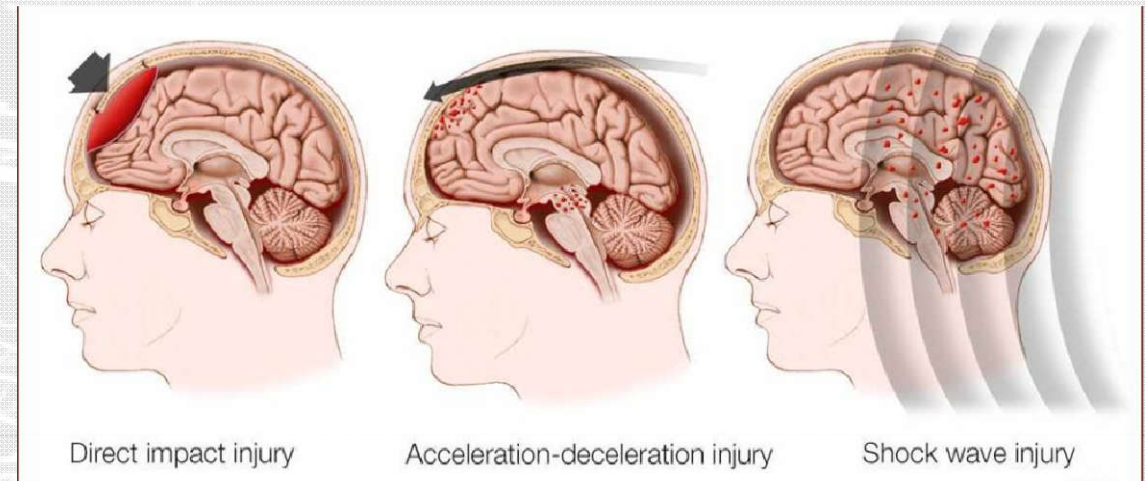
- **Slow** : in morphine and barbiturate poisoning .
- **Rapid,deep(kussmaul) respiration**: in diabetic or uremic acidosis .
- **Hyperpnoea regular alternating with apnea**: lesion affecting both cerebral hemispheres.
- **Central neurogenic hyperventilation**: similar to kussmaul's respiration but lesion at the junction between midbrain and pons.
- **Apneustic breathing**: prolonged pause at full inspiration due to damage to the pons or upper medulla
- **Ataxic breathing**: phases of deep and shallow breathing alternate irregular : due to medullary lesion

## 5. Odour of breath

- Acetone: DKA
- Fetor Hepaticus: in hepatic coma
- Urineferous odour: in uremic coma
- Alcohol odour: in alcohol intoxication

## 6. Skin

- Injuries: traumatic causes
- Dry Skin: DKA, Atropine poisoning
- Moist skin: Hypoglycaemic coma
- Cherry-red: CO poisoning
- Needle marks: drug addiction
- Rashes: meningitis, endocarditis



# Neurological examination:

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- *The goal of a neurological examination in a comatose patient is to determine if the coma is induced by a structural lesion or from a metabolic derangement, or possibly from both.*
- Two findings on exam strongly point to a structural lesion:
  1. consistent asymmetry between right and left sided responses.
  2. abnormal reflexes that point to specific areas within the brain stem.

# Neurological examination:

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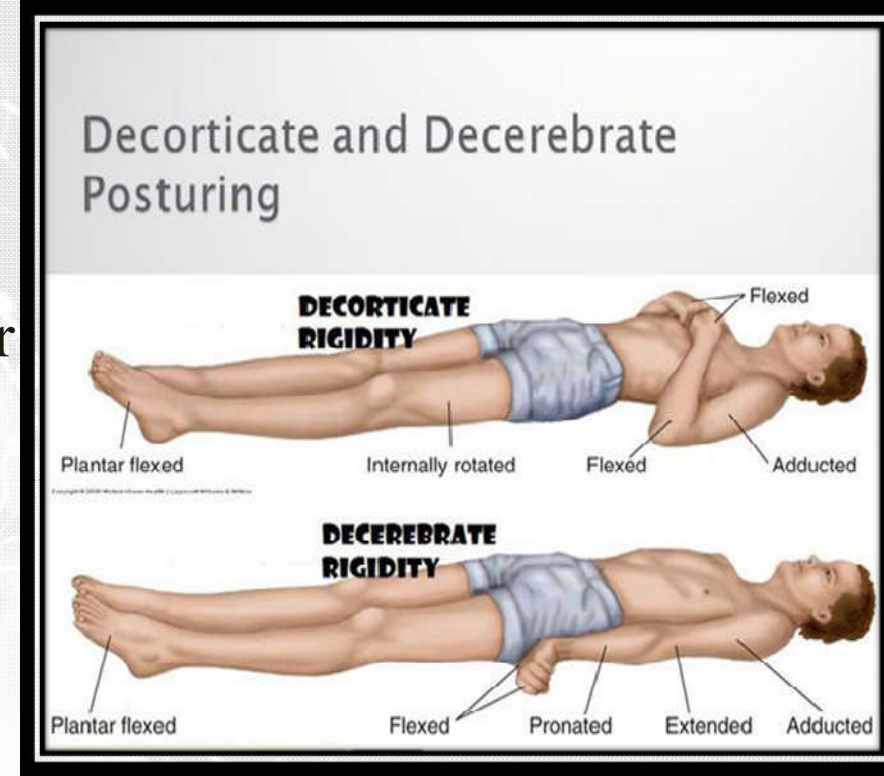
- **Mental status** is evaluated by observing the patient's response to visual, auditory and noxious (i.e., painful) stimuli.

The three main maneuvers to produce a noxious stimulus in a comatose patient are:

1. press very hard with your thumb under the bony superior roof of the orbital cavity
2. squeeze the patient's nipple very hard
3. press a pen hard on one of the patient's fingernails.

# Neurological examination:

- \* Decorticate posturing consists of adduction of the upper arms, flexion of the lower arms, wrists and fingers.
- The lower extremities extend in decorticate posturing.



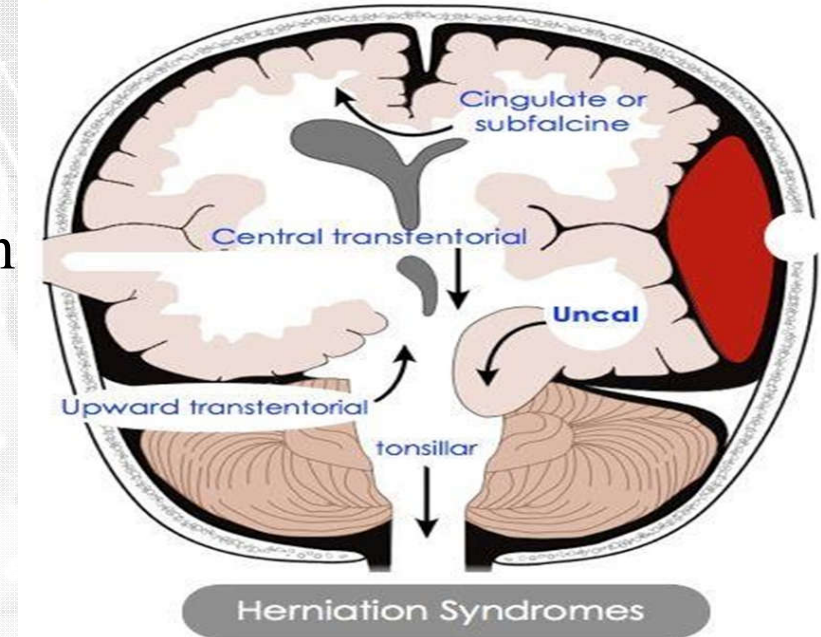
- \* Decerebrate posturing consists of adduction of the upper arms, extension and pronation of the lower arms, along with extension of the lower extremities.

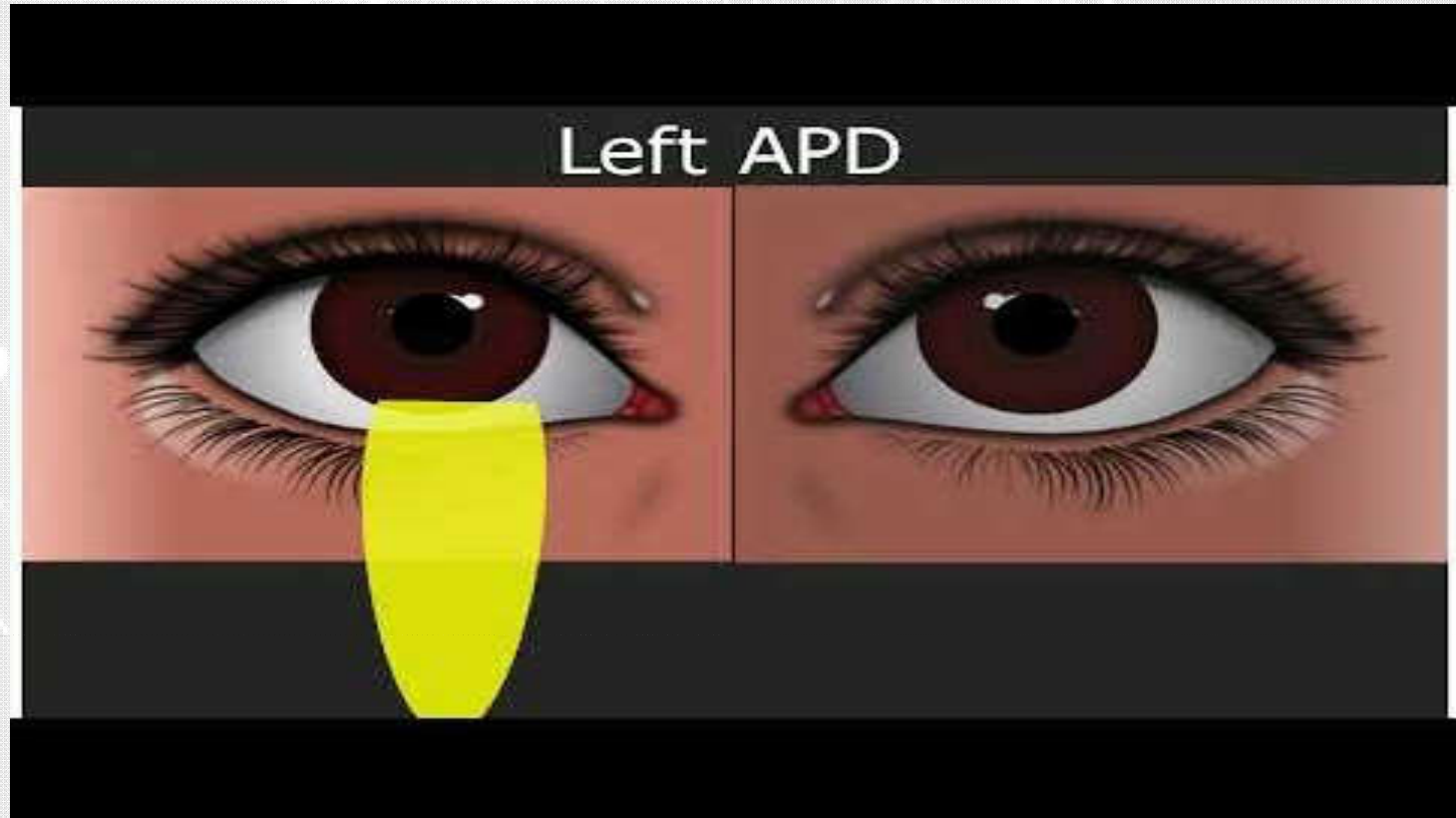
**\*\* These postures are response typically to noxious**

# Neurological examination:

## □ Pupillary signs :

- Dilated , unreactive to light :
  - Unilateral: 3 nerve compression uncal herniation
  - Bilateral : e.g. Atropine poisoning
- Constricted :
  - Horner's syndrome however , alone , this syndrome does not cause coma
  - Bilateral reactive to light : metabolic coma
  - Unreactive to light : pontine hemorrhage , morphine poisoning (pin-point pupil)





Left afferent pupillary defect



# Neurological examination:

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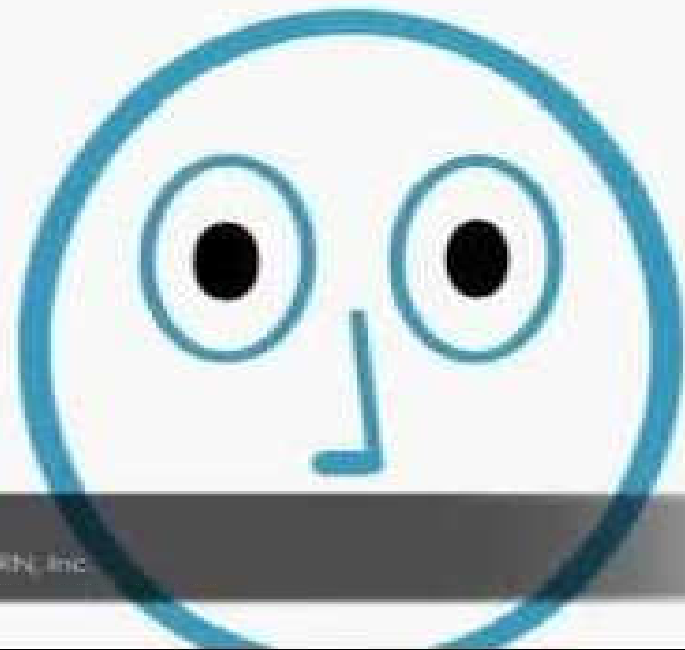
## ❑ Extra ocular muscle examination :

1-The doll's eyes reflex

2- Caloric test: Is a test of the vestibule-ocular reflex that involves irrigating cold or warm water or ear into the external auditory canal

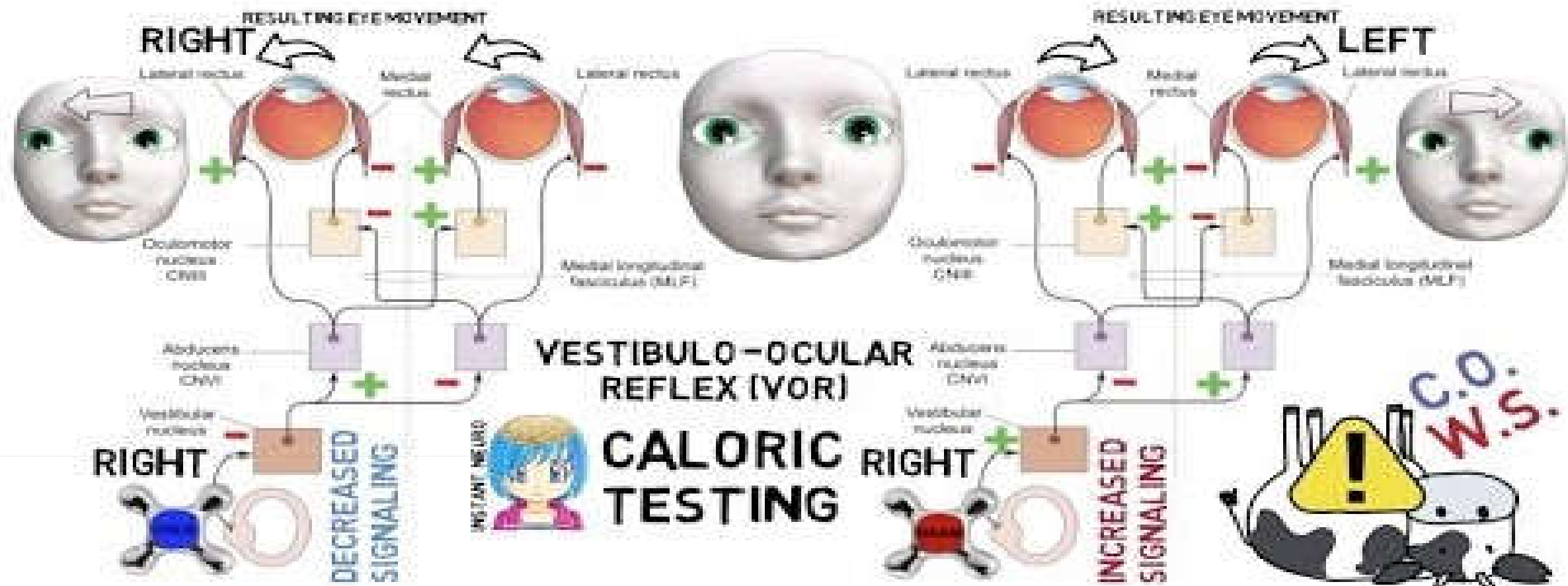
❖ If the water is warm ...causing an increased rate of firing in the vestibular afferent nerve. This situation mimics a head turn to the ipsilateral side. Both eyes will turn toward the contralateral ear, with horizontal nystagmus to the ipsilateral ear

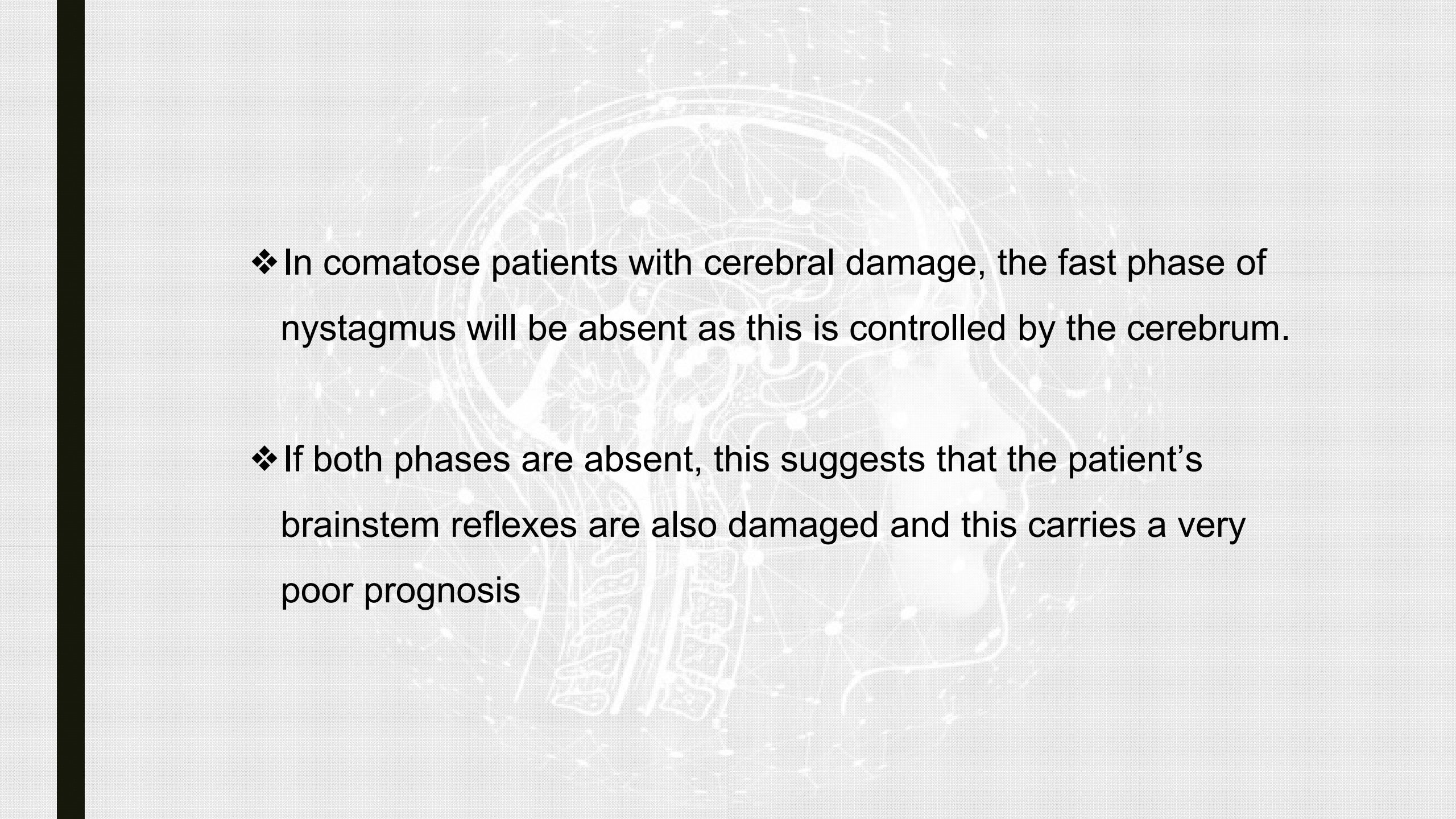
❖ If the water is cold ... decreasing the rate of vestibular afferent firing. This situation mimics a head turn to the contralateral side. The eyes then turn toward the ipsilateral ear, with horizontal nystagmus to the contralateral ear



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- ❖ In comatose patients with cerebral damage, the fast phase of nystagmus will be absent as this is controlled by the cerebrum.
  - ❖ If both phases are absent, this suggests that the patient's brainstem reflexes are also damaged and this carries a very poor prognosis

# Neurological examination:

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- Cranial nerve V (Trigeminal) may be tested in the comatose patient with the corneal reflex test.
- Cranial nerves IX (Glossopharyngeal) and X (vagus) may be evaluated with the gag reflex.

# Gag reflex



# Neurological examination:

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- The motor system is assessed by testing deep tendon reflexes, feeling the resistance of the patient's limbs to passive movements, and testing the strength of posturing and local withdrawal movements.
- The sensory system can only be evaluated by observing the patient's response, or lack of response, to noxious stimuli in different parts of the body.

***Upper Motor Neuron (UMN) vs. Lower Motor Neuron (LMN)  
Syndrome***

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	<b><i>UMN syndrome</i></b>	<b><i>LMN Syndrome</i></b>
<b>Type of Paralysis</b>	<b><i>Spastic Paresis</i></b>	<b><i>Flaccid Paralysis</i></b>
<b>Atrophy</b>	<b><i>No (Disuse) Atrophy</i></b>	<b><i>Severe Atrophy</i></b>
<b>Deep Tendon Reflex</b>	<b><i>Increase</i></b>	<b><i>Absent DTR</i></b>
<b>Pathological Reflex</b>	<b><i>Positive Babinski Sign</i></b>	<b><i>Absent</i></b>
<b>Superficial Reflex</b>	<b><i>Absent</i></b>	<b><i>Present</i></b>
<b>Fasciculation and Fibrillation</b>	<b><i>Absent</i></b>	<b><i>Could be Present</i></b>

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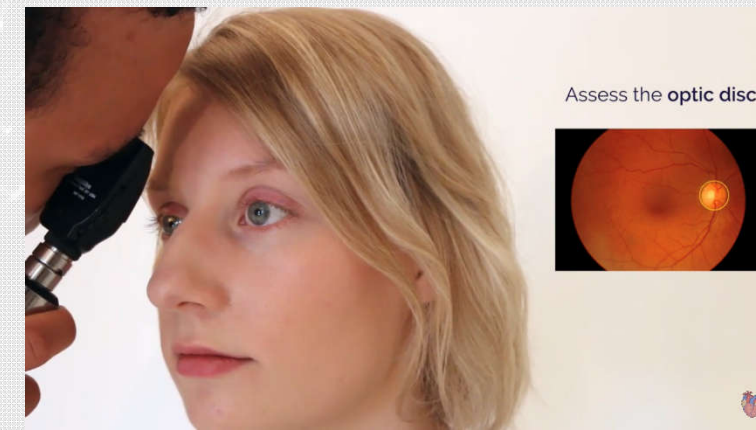


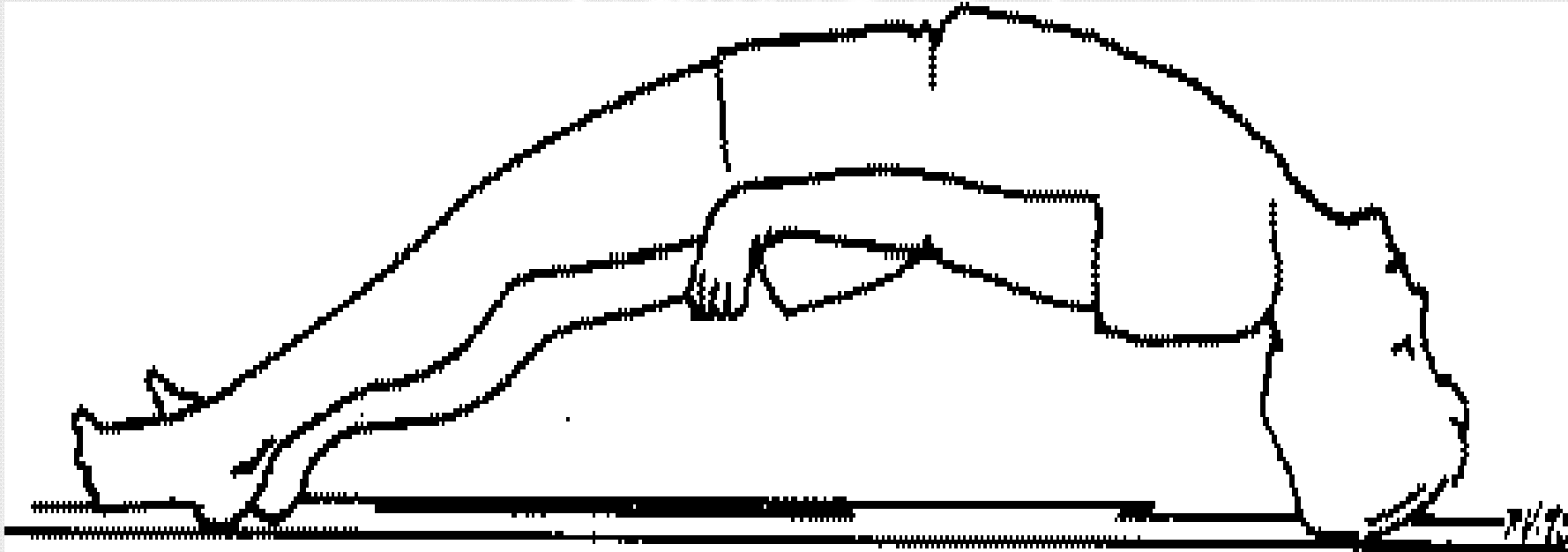
## Fundus examination:

For papilloedema in cases of ICP

## Signs of meningeal irritation :

Neck stiffness, positive kernig's sign and Brudski's sign  
in cases of meningitis and subarachnoid heamorrhage





**Opisthotonus** : is a symptom seen in some cases of sever cerebral palsy and traumatic brain injury or as a result of severe muscular spasm associated with tetanus



Brudzinski's neck sign

ADAM.



Kernig's sign