Team Medicine

#19

Altered Level Of consciousness

Writer: Bader AlGhamdi
Reviser1: Sara Alkhelb
Reviser 2:Khaled Al Shaibani

Leader: Sama Al Ohali

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431 Teams

Altered level of Consciousness

Definitions:

- Consciousness defined as being awake and aware of both one's self and one's surroundings, OR it is the human awareness of both internal(internal like internal pain, hunger…) and external(like calling or punching the patient , it could be verbal or visual) stimuli.
- Level of consciousness: is a measurement of a person's arousability and responsiveness to stimuli from the environment.
- Altered Consciousness covers a spectrum of states:
  - Consciousness
  - Lethargy
  - Stupor or Obtunded
  - Coma

- Lethargy: mild depression in level of consciousness and can be aroused with little difficulty. Like when you call a patient for several times he will respond (little/verbal stimuli).
- Obtunded: More depressed level of consciousness and cannot be fully aroused. (Slow response and sleepiness), so when calling a patient he will respond a bit late and weak.
- Stuporous: Cannot be aroused from a sleep like state. (Only respond by grimacing or drawing away from painful stimuli)
- Coma: More depressed level of consciousness and unable to make any purposeful response. Not response to verbal nor painful stimuli.

> The doctor said it is important to differentiate between these states, and the questions in the exam will be case scenario about them.

Pathophysiology:

Reticular formation or reticular activating system (RAS) is known to play a role in alertness, wakefulness and arousal.Ascending reticular activating system is a group of neural connections that receive sensory input and projects to cerebral cortex through the midbrain and thalamus from the reticular formation.Any major thing that interferes in this pathway will cause ALOC.

ALOC (altered level of consciousness) clinical features:

There are 4 pathophysiologic variables, which are respiratory pattern, pupillary light reflexes, spontaneous eye movements, and motor responses.We need to know these features to localize the lesion and to know the severity.

1- Respiratory pattern:Ventilation is governed by lower pons and medulla. Modulated by forebrain cortical centers. Respiration is affected because it is near to RAS

Patterns from rostrocaudal involvement:

- Cheyne Stokes respirations: Hyperapnea (deep and fast) alternating with apnea.
- Central neurogenic hyperventilation:
  - Regular and rapid respirations
  - Normal PaO2 and low PaCO2(low CO_2 due to hyper ventilation)
  - Midbrain lesion

- Brain's attempt to reduce ICP(in case of stroke or hemorrhage brain will stimulate itself to hyperventilate because low CO_2 causes vasoconstriction that will decrease ICP)

- Apneustic breathing
  - Deep, gasping inspiration with a pause at full inspiration followed by a brief, insufficient release
  - Signifies damage to lowerPons/medulla.

2- Pupillary reflexes:Pupillary pathways near ARAS (ascending reticular activating system). So anything will affect the ARAS system will affect the pupillary reflexes.
Pupillary reflexesare resistant to metabolic insult. It is the single most important physical finding to distinguish structural vs. metabolic diseaselike hypoglycemia.In other words, pupillary reflexes are affected mainly by structural insults like masse , it is also affected by drugs.

- Bilateral enlarged and unreactive pupils indicate massive CNS dysfunction (anoxia, barbiturate severe hypothermia and anticholinergicspoisoning). It happens post cardiac arrest. This situation means poor prognosis.
- Pinpoint pupils indicate pontine hemorrhage(most common cause) , Opiates, organophosphate poisoning.
- Unilateral fixed dilated pupil indicate ipsilateral expanding mass and possible herniation(massive stroke lead to ancul herniation).
- Drugs also affect pupils
- Opiates – pinpoint pupils
- Anticholinergics – large pupils

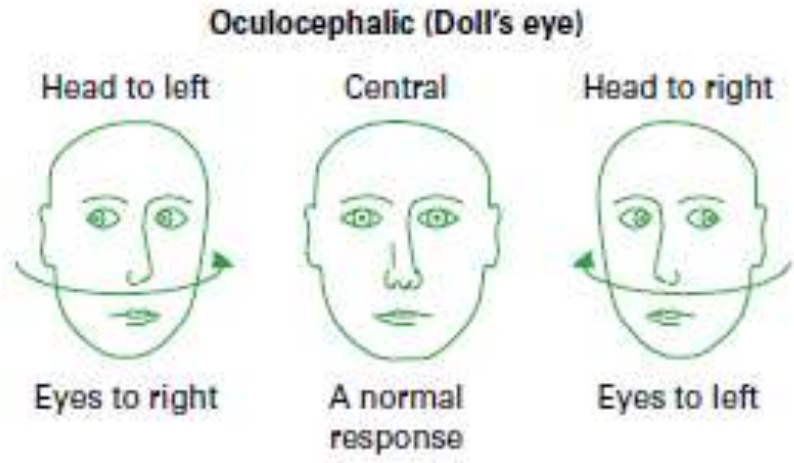
What is uncal herniation? it is the herniation of the innermost part of the temporal lobe, the uncus , towards the tentorium and that will puts pressure on the brainstem ,and will squeeze third cranial nerve, which may affect the parasympathetic input to the eye on the side of the affected nerve

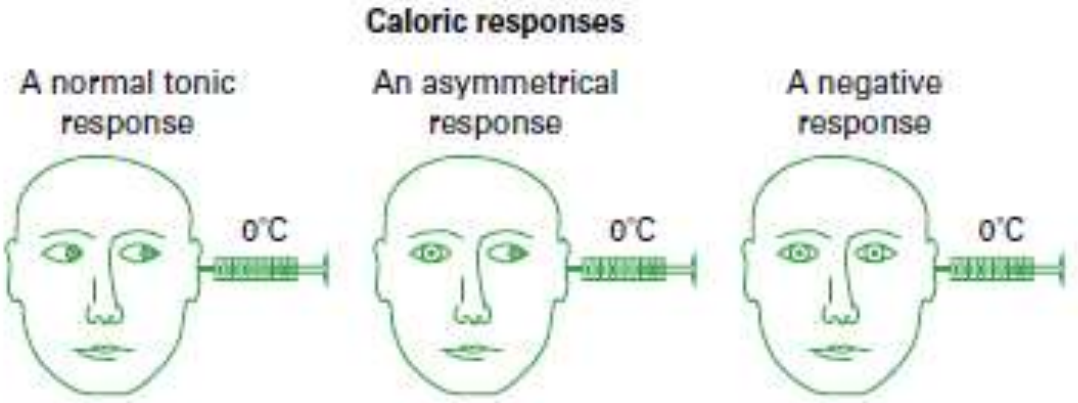
3- Eye movements:
In light stage of coma, roving side-to-side movements occur. Persistent deviation to one side may indicate focal seizure activity. Structural brainstem lesions abolish conjugateeye movements.

- Oculocephalic reflex ("doll's eyes")
  we should do it in any comatose patient to know if there is brain death or not. It is a part of brain death examination.
- – hold eyelids open and rotate head from side to side
  - Normal or positive – conjugate deviation of eyes away from direction of head movement .
  - Contraindicated in c-spine injuryafter RTA.

- Oculovestibular reflex – elevate head of bed 30 degrees and inject 10-50ml of ice water (usually we use normal saline)into ear canal.
  - Normal response is nystagmus with slow phase towards irrigated ear and fast beats away
  - Unconscious pt. with intact brainstem eyes move towards stimulus(withoutnystagmus)and remain tonically deviated for a minute and slowly return to midline. Patients with brainstem death will have negative response.
  - Contraindicated if tympanic membrane is not intact(ask relative about any ear problems because it is an elective examination not argent)

For your information: EEG is not ordered in USA and Canada to diagnose brain death, because it is not a tool for conformation.

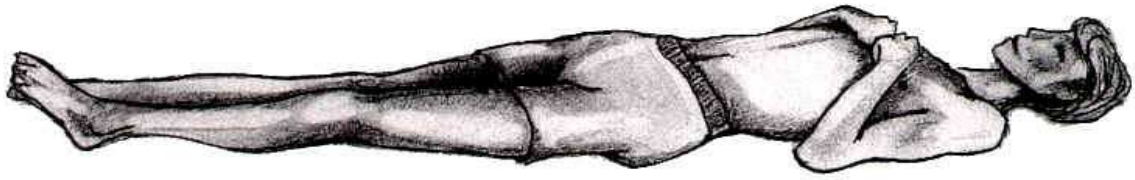




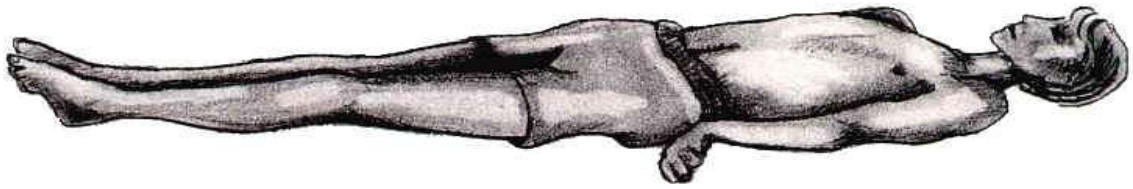
4-Motor Responses:

- Assess muscle strength, tone and deep tendon reflexes for normality and symmetry
- Assess if pt. can localize motor responses to determine level of brain lesion
- Start first with verbal stimuli (ask the patient to elevate his hand) if no response move to painful stimuli then lastly asses posture.

Decorticate posturingwith elbows, wrists and fingers flexed, and legs extended and rotated inward. Lesion in cortex or subcortical white matter



Decerebrate posturing with rigid extension of arms and legs. Lesion at brainstem, usually pons



Glasgow Coma Scale:

The Glasgow Coma Scale or GCS is a neurological scale that aims to give a reliable, objective way of recording the conscious state of a person for initial as well as subsequent assessment.
It is the only test can give us a hint about the degree of coma.

Table 1 Glasgow coma scale. Adapted from Teasdale *et al*[1]

Eye opening (E)	
Nil	1
Pain	2
Verbal	3
Spontaneous	4

Motor response (M)	
Nil	1
Abnormal extension	2
Abnormal flexion	3
Weak flexion	4
Localising	5
Obeys commands	6

Verbal response (V)	
Nil	1
Incomprehensible	2
Inappropriate	3
Confused	4
Oriented fully	5

Abnormal extension takes 2 points because the problem is in the brainstem, which is more important

Severe, with GCS ≤ 8Moderate, GCS 9 – 12Minor, GCS ≥ 13

-Inappropriate verbal response means a patient can form understandable sentences but inappropriate in relation to the subject. Whereas, incomprehensible means forming sentences that cannot be understood.
- the lowest score is 3
-in motor response :
Abnormal flexion = decorticate
Abnormal extension = decerebrate = brain stem lesion

Etiologies:

Altered Level of Consciousness (ALOC):It is one of the most difficult diagnostic and management problems. It requires quick action to avoid irreversible damage. It has a wide array of possible diagnoses. ALOC is a symptom of another problem, not a diagnosis itself.

Causes:

- A – Alcohol, Abuse (physical or substance)
- E – Encephalopathy, Electrolytes
- I – Insulin (hypoglycemia)
- O – Overdose, Oxygen deficiency
- U - Uremia
- T – Trauma, Temperature abnormality, Tumor
- I - Infection
- P – Poisoning, Psychiatric, Psychogenic(every thing is normal,it is a diagnoses of exclusion)
- S – Shock, Stroke, Seizures, Shunt

Mnemonic is AEIOU TIPS

- Electrolytes:

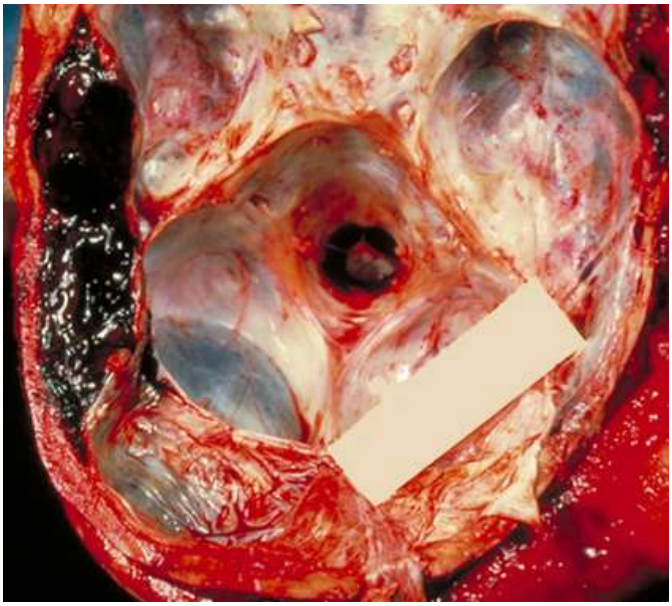
- Abnormality in any cation (Na, Ca, Mg, Phosphorus)
- Metabolic acidosis or alkalosis
- Hypoglycemia – most common (In KSA is very common)
- Hyperglycemia – especially new onset diabetes have ALOC due to hyperosmolarity(non ketotic hyperosmolar status)
- DKA can lead to cerebral edema.

- Seizures:

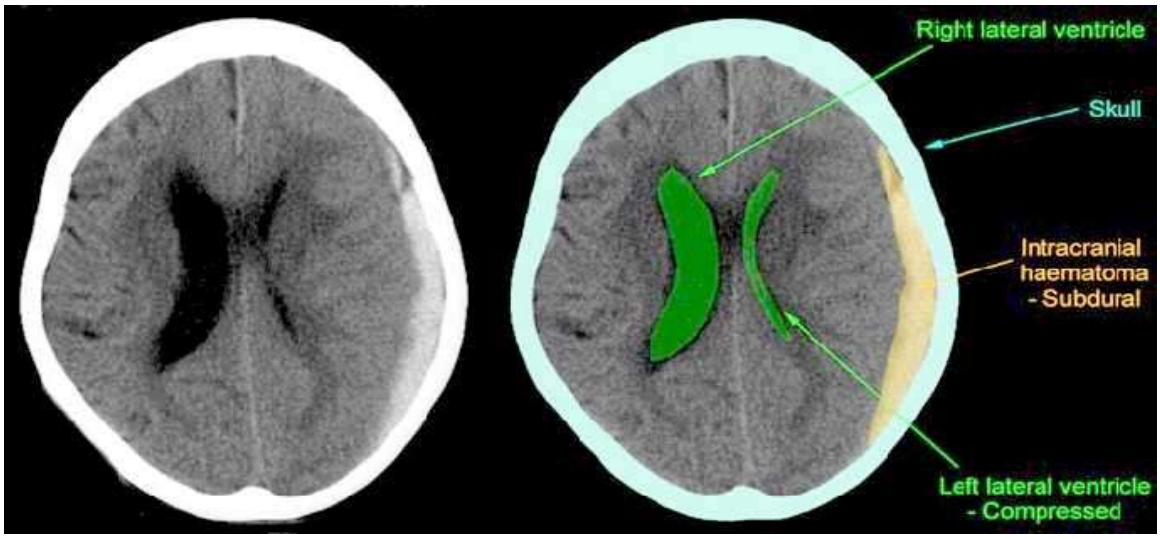
All seizures except petit mal are followed by a post-ictal state. Measure drug levels for patients on anticonvulsants.(both decrease and increase levels can cause seizures)
Comatose patients may have non-convulsive seizures (subclinical seizures that caused by old stroke, hypoxia during delevary….)needing an EEG to diagnose.Measuring level of CK directly after the seizures will reveal very high amount of CK in blood.

-Trauma:

- Epidural Hematoma
  - Lens shaped
  - Caused by arterial rupture
  - Skull fracture present in 85% of cases



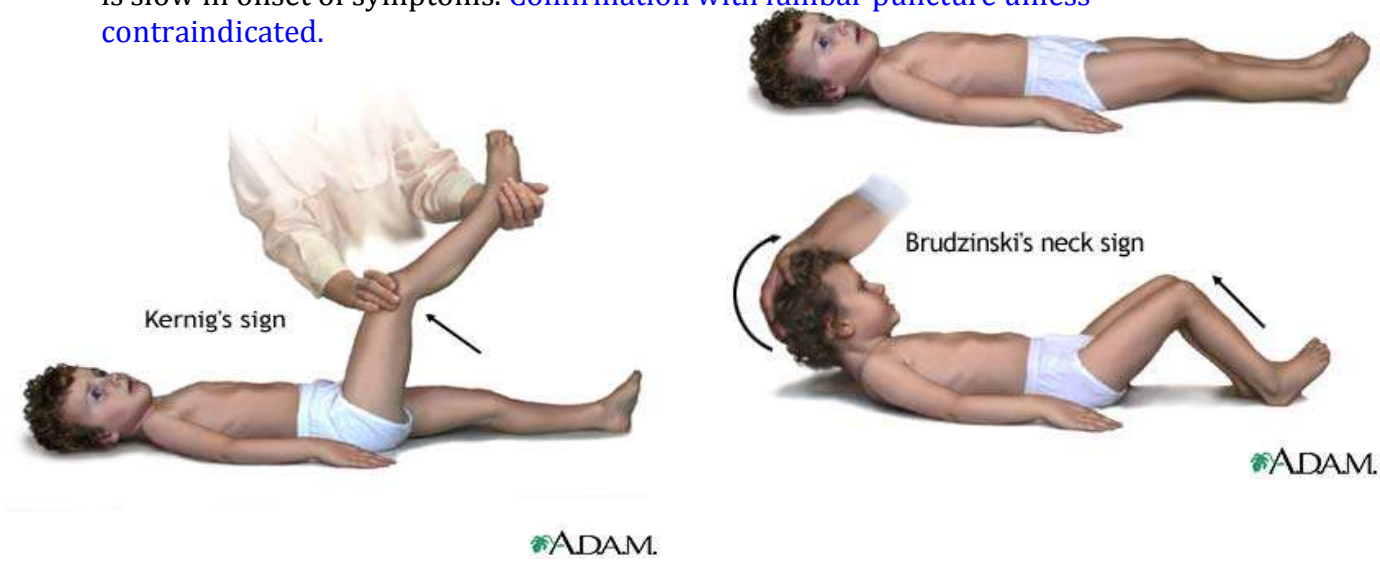
- Subdural hematoma
  - Crescent shaped
  - Caused by tearing of bridging veins through dura and arachnoid
  - Skull fracture present in 30% of cases
  - Retinal Hemorrhage in 75% of cases



  - Cerebral Contusion can lead to increased ICP

- Meningitis:

Bacterial is the most common and it is severe enough to cause ALOC. The non-bacterial is slow in onset of symptoms. Confirmation with lumbar puncture unless contraindicated.



-Infections:

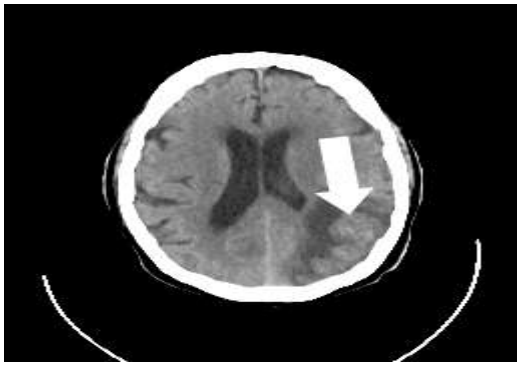
likeBrain abscess, chronic sinusitis, chronic otitis, dental infection, endocarditis or uncorrected cyanotic congenital heart disease can increase risk.

Brain abscess has a ring like appearance on imaging.

- Encephalitis:
  inflammation of the brain parenchyma usually due to viral infection

- HSV – most common devastating cause
  - Death or permanent neurologic damage in 70% of cases
  - Affects temporal lobes causing seizures, parenchymal swelling and uncal herniation
  - It is more commonly to cause ALOC because it is an inflammation to the brain itself
  -

- Stroke:



- Hemorrhagic is usually due to aneurysm with severe headache.
- AVM (arterio-venous malformation) or cavernous hemangioma (low flow and less acute symptoms) .
- Thrombosis or Embolic Stroke
  - Occlusion of anterior, middle or posterior cerebral artery will NOT cause coma
  - Infarcts eventually lead to increased ICP
  - Cerebellar infarcts rarely have coma
  - Basilar Artery infarcts cause rapid coma due to brainstem damage

ALOC is more common in hemorrhagic stroke than in ischemic, ischemic stroke usually slower in onset and progression. Only major strocke will cause ALOC.

- Hypoxia:
  - Neurons extremely sensitive to hypoxia and cease function within seconds of hypoxia
  - Permanent CNS dysfunction can occur within 4-5 minutes of total anoxia at body temperature(after cardiac arrest)
  - Hypercarbia can also cause neurologic depression and coma

- Temperature:
Hypothermia - Each drop by 1 degree Celsius causes a 6% drop in cerebral blood flow
Hyperthermia - Headache, vomiting, seizure, obtundation, or coma result especially above 41 degrees C. (it is usually happened in heat stroke)

Investigation:

✓ CT brain ✓ MRI brain ✓ Glucose ✓ Electrolytes ✓ LFTs(hepatic encephalopathy) ✓ BUN(uremia) ✓ PT, PTT ✓ Calcium	✓ Serum ○ Ammonia ○ Osmolality ○ Calcium ○ Ketones ○ Alcohol ○ Drug concentrations ✓ ABGs

Treatment:

- Basic:

A. Establish an airway, maintain as indicated, suction as needed; assist ventilations as indicated.
B. Administer high concentration oxygen.
C. Transport the patient in the coma/recovery position (if trauma is suspected, transport supine with cervical collar and backboard).

- Intermediate:

D. If the patient is in respiratory arrest, perform advanced airway management.
E. Secure IV access. Obtain blood specimen for glucose determination at the hospital if the receiving hospital desires it.
F. Perform capillary blood glucose determination.
G. If patient's blood glucose level is <80 mg/dl, administer dextrose 50% 25 gm
H. Unless patient responded to dextrose administration, contact medical direction for an order to administer 2 mg of naloxone intravenously.
I. Administer thiamine 100 mg IV if dextrose is to be administered.
J. If IV access cannot be secured and the patient's blood glucose level is <80 mg/dl, administer 1 mg glucagon IM.
K. Then treat underlying cause.
   - Start with ABC , Major stabilization to the patient then start to treat the underling cause
   - remember always to give thiamine in case of alcohol withdrawal.

Summary:

(Mind Map click here)

Questions:

1. A 56-year-old female found unresponsive is brought to the ED. On examination she is found to have decorticate posturing. Which of the following is consistent with this condition?
    A. Flexion at the elbow, plantar lower extremity extension.
    B. Upper and lower extremities extension.
    C. Flexion at the wrist and finger, lower extremity flexion.
    D. Extension at the elbow, plantar lower extremity flexion.

2. A 19 year-old female present to the ED with sever head injury due to a motor vehicle accident. Her Glasgow coma scale is 4. Which of the following is NOT possible for her to be preforming?
    A. Extension response.
    B. Incomprehensible sounds.
    C. Eyes open in response to pain.
    D. Inappropriate words.

3. A patient is found in a "sleep-like" state, not responsive to verbal stimuli and poorly responsive to tactile stimuli, but he can be aroused by constant and continuous stimulation. When aroused, his cognitive function is significantly impaired. Which of the following state of the consciousness correlate with the findings on this patient?
    A. Coma.
    B. Stupor.
    C. Lethargy.
    D. Obtunded.

4. Which of the following findings is will be seen in comatose patient with a brainstem lesion and pinpoint pupils?
    A. Apneustic breathing pattern.
    B. Hyperventilation with decorticate posture.
    C. Chyne Stokes breathing.
    D. Central neurogenic hyperventilation.

Key Answers:
(1:A – 2:D – 3:B - 4:A)

Explanation:

1. Answer: A, Decorticate posturing consists of upper extremity adduction and flexion at the elbow, wrist, and fingers along with lower extremity extension.

2. Answer: D, Inappropriate words gives her a score of 3 if we consider motor response = 1 and eye opening = 1 the least sore will be 5. The case mentioned that her score is 4 and preforming inappropriate words is impossible and the other choices could be performing in the score 4.

3. Answer: B, this patient is stuporous :Cannot be aroused from a sleep like state. (Only respond to painful stimuli)

4. Answer: A, Apneustic breathing pattern is seen in a patient with pontine lesion so that's why patient with pontine lesion has pinpoint pupils along with apneustic breathing.