Impair Consciousness

Coma or loss of consciousness may be defined as a loss of awareness of one's self or environment. Glasgow Coma Scale (GCS) is used to assess the level of consciousness:

Glasgow Coma Scale (GCS)
Upper score =15 Lowest score = 3

Score	Response	Determinant
4	Spontaneously	Eye opening
3	To speech	
2	To pain	
1	None	
5	Oriented (time, place, person)	Best verbal response
4	Disoriented (confused speech)	
3	Inappropriate words	
2	Incomprehensible sounds	
1	None	
6	Obey commands	Best motor response
5	Localizing pain	
4	Withdrawal to pain	
3	Flexion to pain (decorticate)	
2	Extension to pain (decerebrate)	
1	None	

Coma according to GCS is defined as **inability to obey command, to speak words and to open the** eyes. Therefore; none of patients with GCS of 9 or more are found to be in coma, but 90% of those with GCS of 8 or less could be found in coma. The conscious state depends on the integrity of the reticular activating system, beginning in the medulla and extending to thalamus. The reticular nuclei seem to supply a baseline arousal level somewhat like the power control to a computer. The cerebral hemispheres may be thought of as analogous to the software and memory of a computer system. Therefore; the cause of impair consciousness can be classified into:

A- Cerebral hemispheres lesions: like diffuse cortical lesions (hypoxia, hypoglycemia ...etc)

B- Brainstem lesions: includes;

1- Supratentorial mass lesion through uncal herniation (cerebral tumors)

2- Direct lesion in the brainstem itself (Hemorrhages)

3- Infratentorial lesions with secondary compression on the brainstem (Cerebellar tumors).

Evaluation of Comatose Patient

(1) **Airway:** Establish an adequate airway

(2) **Breathing:** Assess respiratory pattern and ensure adequate oxygenation and ventilation. The rate and rhythm of spontaneous respiration should be noted:
a- Cheyne-Stokes respiration: seen in patients with diffuse forebrain lesions; in whom they became hypersensitive to normal level of CO_2. This results in hyperventilatory phase which blows off CO_2 and results in apnea for a brief period. During apnea, CO_2 accumulates to normal level; thus cycles of hyperventilation and apnea alternate.
b- Central neurogenic hyperventilation: seen in severe midbrain lesions. It is rapid, deep respiration result
c- Apneustic breathing: It is characterized by prolonged pause at full inspiration. It usually results from lesion of the Pons.
d- Ataxic breathing: It occurs in patient with medullary lesions, where the respiratory center is located. The breathing is very irregular with deep and shallow breaths occurring
randomly.

(3) **Circulation:** assess vital signs (Gushing Triad).

(4) **Cervical stabilization** as needed.

(5) Obtain blood for basic studies and administer intravenous hypertonic **glucose.**

(6) **General examination** (Chest, Abdomen ...etc)

(7) **Neurological examination:** concentrating on GCS, pupillary size and brain stem reflexes (oculo-cephalic, oculo-vestibular, corneal reflexes...etc).

Oculo-vestibular reflex (Ice water Caloric test): It is usually performed with cold or ice water. The head is elevated to 30 degrees, 15 to 20 ml. of very cold water are instilled in the auditory canal with syringe. In unconscious patient with intact brainstem, conjugate tonic deviation of each eye is observed toward the side of the ear that is irrigated. The test should not be performed in patient with traumatic injuries unless it is certain that there is no disruption of petrous bone (signs of middle cranial fossa fractures) is present, to avoid contamination of intracranial space from auditory canal.

Oculo-vestibular reflex (ice-water caloric test).
(A) Cold caloric stimulation in comatose patient causes slow tonic deviation of the eyes toward the stimulated side, if the brainstem is intact.
(B) With a damaged brainstem, the eyes are immobile despite cold caloric stimulation.

Oculo-cephalic reflex (Doll's eye movement): It should not be performed in a patient with traumatic injury unless there is clear evidence that the cervical spine is intact. To test the oculo-cephalic reflex, the patient eyelids must be held open and his

head rotated briskly from one side to the other. In patient with intact brainstem, the eyes conjugate deviated to the side opposite to the direction in which the head is turned. Vertical eye movements can be tested by extending or flexing the neck which also results in opposite eye movements. This reflex can not be demonstrated in conscious individual because of the intact inhibitory influences from cerebral hemispheres.

Oculo-cephalic reflex (Doll's eye movements)

(C) In unconscious patient with intact brainstem function, doll's eye movements can be elicited. As one briskly turns the head to one side, the eyes lag behind and roll toward the opposite side.

(D) In deeply comatose patient with absent brainstem function the doll's eye movements are absent. The eyes have a fixed forward stare and move with the head.

Treatment of Comatose Patient

After patient evaluation, and excluding non-CNS causes of coma (like metabolic causes):

(A) **If herniation syndrome** or signs **of expanding posterior fossa lesion** with brainstem compression are present, lower the intracranial pressure and obtain CT scan for diagnosis. Lumbar puncture is contraindicated. Operating room should be notified to avoid unnecessary post-CT scan delays if surgically operable lesion is detected.

(B) If no evidence of herniation is detected; Brain CT scan should be obtained. **If meningitis** is suspected, and there is no mass lesion presence in the CT scan (especially in posterior fossa), then lumbar puncture is indicated for diagnosis. Treatment should be instituted immediately. If CT scan shows coexisting mass lesion in a patient in whom an infectious causes is strongly suspected (e.g. rupture abscess) especially in posterior fossa, CSF examination could be obtained by methods other than lumbar puncture; like ventricular tap, but antibiotic therapy should not be delayed.

Epilepsy if present should be treated by anti-epileptic medications.gh level of PO_2 and low level of CO_2.

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