COMA
Clinical Presentation

SIGNS AND SYMPTOMS

General

• No spontaneous eye opening
• Lack of response to painful stimuli
• No motor activity
• Regular cardiorespiratory function
• Glasgow Coma Scale (GCS) Scoring
• Hypothermia
» Infection, hypoglycemia, myxedema coma, alcohol and sedative poisoning
• Fever
» Infection, thyrotoxicosis, anticholinergics, sympathomimetics, neuroleptic malignant syndrome, hypothalamic hemorrhage
• Hypertension
» Structural lesion, hypertensive encephalopathy
• Hypotension
» Systemic disease
» Sepsis should be highly considered

HEENT

• Mydriasis
» Organophosphates
• Miosis
» Narcotics
» Anticholinergics
» Pontine lesion
• Loss of pupillary reflexes or unequal pupils
» Structural lesions
• Evidence of head trauma
» Contusions
» Hematomas
» Lacerations
» Hemotympanum
• Neck
» Nuchal rigidity
– Meningitis
– Subarachnoid hemorrhage

Neurologic

• Decorticate posturing
» Flexion of elbows and wrists

» Adduction and internal rotation of shoulders
» Suppination of the forearms
» Suggests severe damage above the midbrain
• Decerebrate posturing
» Extension of elbows and wrists
» Adduction and internal rotation of shoulders
» Pronation of the forearms
» Suggests damage at the midbrain or diencephalon
• Asymmetrical movements
» Structural lesions
• Persistent twitching of an extremity
» Status epilepticus

MECHANISM/DESCRIPTION
• Unarousable unresponsiveness
• Light coma
» Responds to noxious stimuli
• Deep coma
» Does not respond to pain
• Loss of either arousal or cognition
» Loss of arousal
– Arousal is primarily a brain stem function
– Impairment of the reticular activating system
» Loss of cognition
– Requires dysfunction of both cerebral hemispheres
• Stupor
» Deep sleep though not unconsciousness
» Exhibits little or no spontaneous activity
» Awaken with stimuli
» Little motor or verbal activity once aroused
• Obtundation
» Mental blunting with mild or moderate reduction in alertness
• Delirium
» Floridly abnormal mental status
– Irritability
– Motor restlessness
– Transient hallucinations
– Disorientation
– Delusions
• Clouding of consciousness
» A disturbance of consciousness
» Impaired capacity
– To think clearly

– To perceive, respond to, and remember current stimuli

ETIOLOGY

• Diffuse brain dysfunction
» Lack of nutrients
– Hypoglycemia
– Hypoxia
» Poisoning
– Ethanol
– Isopropyl alcohol
– Ethylene glycol
– Methanol
– Salicylates
– Sedatives
– Narcotics
– Anticonvulsants
– Isoniazid
– Heavy metals
» Infection
– Bacterial meningitis
– Encephalitis
– Falciparum meningitis
– Rabies
» Hepatic encephalopathy
» Endocrine Disorders
– Myxedema coma
– Thyrotoxicosis
– Addison's disease
– Cushing's disease
– Pheochromocytoma
» Electrolyte disorders
– Hypernatremia, hyponatremia
– Hypercalcemia, hypocalcemia
– Hypermagnesemia, hypomagnesemia
– Hypophosphatemia
– Acidosis, alkalosis
» Temperature regulation
– Hypothermia
– Heat stroke
– Neuroleptic malignant syndrome
– Malignant hyperthermia
» Uremia
» Postictal state, status epilepticus

» Psychiatric
• Supratentorial 19%
» Hemorrhage 15%
– Intraparenchymal hemorrhage
– Epidural hematoma
– Subdural hematoma
– Subarachnoid hemorrhage
» Infarction 2%
– Thrombotic arterial occlusion
– Embolic arterial occlusion
– Venous occlusion
» Tumor or abscess 2%
– Hydrocephalus
– Herniation
– Hemorrhage from erosion into adjacent blood vessels
• Subtentorial lesions 12%
» Infarction
» Hemorrhage
» Tumor
» Basilar migraine
» Brain stem demyelination

Pre-Hospital

CAUTIONS
• Airway management if loss of airway patency
» Supplemental oxygen
» Bag-mask ventilation with cricoid pressure
» Endotracheal intubation if no response to coma cocktail
• Intravenous access
• Coma cocktail
» Dextrose
» Narcan
• Monitor patient
• Look for signs of an underlying cause
» Medications
» Medic alert bracelets
» Document a basic neurologic examination
» GCS
» Pupils
» Extremity movements

CONTROVERSIES
• Empirical dextrose should not be held or delayed if dextrostik is not available
» Glucose can safely be administered before thiamine
» Glucose does not worsen outcome in patients with stroke
» Hypoglycemia is a much more likely cause of coma than a CVA

Diagnosis

ESSENTIAL WORKUP
• Detect and treat reversible causes
• Determine the underlying cause
• Immediate exclusion of comalike states
» Noting resistance to passive opening of eyelids, fluttering of eyelids when stroked, abrupt eyelid closure, eye movement by saccadic jerks (rather than roving), or finding the eyes rolled back
» Provocation of nystagmus with ice-water caloric testing
» Before paralyzing a patient for intubation an attempt should be made to detect a locked-in syndrome
» Demonstrating that the patient is able to blink on verbal command will establish this diagnosis
» Intubation is still indicated to prevent aspiration

LABORATORY
• Dextrostick
• CBC
• Electrolytes

IMAGING/SPECIAL TESTS
• Head CT scan
» Diagnosis of hemorrhage and midline shift
• Lumbar puncture
» All patients with coma of unknown etiology, particularly if fever is present
» Antibiotics may be administered before lumbar puncture
– This will have little effect on CSF cell count, differential, glucose, and protein for as long as 68 hours
» Control seizures first
» Noninvasive diagnostic studies such as CT scan should be performed before lumbar puncture in adults and children if there is evidence of increased intracranial pressure, a mass lesion, preexisting trauma, or focal findings
– Risk of tonsillar herniation in patients with a mass lesion is very small
• Electroencephalography
» Performed to rule out suspected seizure activities
» Little use in the emergency evaluation

– Status epilepticus should be treated empirically
– Rarely necessary to distinguish seizures from myoclonic movements
– Unlike EEG studies performed in a laboratory, lighting will cause artifacts

DIFFERENTIAL DIAGNOSIS
• Locked-in syndrome
• Psychogenic unresponsiveness

Treatment

INITIAL STABILIZATION
• Oxygenation
» Nonrebreather face mask
» Augment breaths with bag-valve mask
» Endotracheal intubation
• Empiric use of naloxone

ED TREATMENT
• Consider empirical use of antibiotics for coma of undetermined etiology
» Broad spectrum with good CSF penetration such as ceftriaxone
• Administer mannitol if clinical or radiographic evidence of impending herniation
• Stop seizure activity with benzodiazepines
• Empiric treatment for a toxic ingestion
» Activated charcoal
» Alcohol drip if methanol or ethylene glycol suspected
• Correct body temperature
» Warmed humidified O2 if hypothermic
» Ice packs and forced air movement over exposed wetted skin if severe hyperthermia
• Specific therapy directed at underlying cause once identified

MEDICATIONS
• Ceftriaxone: 100 mg/kg IV
• Dextrose: 1-2 ml/kg of D50W IV; neonate: 10 ml/kg D10W IV; peds: 4 ml/kg D25W IV
• Diazepam: 0.1-0.3 mg/kg slow IV (max: 10 mg/dose) q 10-15 min × 3 doses
• Lorazepam: 0.05-0.1 mg/kg IV (max: 4 mg/dose q 10-15 min)
• Mannitol: 0.25-1.0 g/kg IV over 20 min
• Naloxone: 0.01 mg/kg IV/IM/SC/ET
• Physostigmine: 0.06-0.08 mg/kg IV
• Thiamine: 100 mg IM or 100 mg thiamine in 1000 ml of intravenous fluid wide open

Disposition

ADMISSION CRITERIA

• All patients who do not have a readily identifiable and completely reversible cause should be admitted

DISCHARGE CRITERIA

• Comatose patients with correctable hypoglycemia and opiate toxicity who respond completely to aggressive ED treatment

Miscellaneous

ICD-9-CM CODE:

780.01 Coma

780.0 Alteration of consciousness

780 General symptoms

SUGGESTED READINGS

Ellenhorn MJ, ed. Ellenhorn's medical toxicology: diagnosis and treatment of human poisoning. Philadelphia: Williams & Wilkins, 1997:16-19.

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