LAB DIAGNOSIS AND MANAGEMENT OF COMA (UNCONCIOUS PATIENT)

Professor Dr. Abdus Salam Khan

MBBS, M.Phil, PhD

HOD Pathology

Women Medical College Abbottabad

Definition

Persistent loss of consciousness or coma is a state in which patient is totally unaware of both self and external surroundings and unable to respond meaningfully to external stimuli

The Unconscious Patient

Challenges in assessment

- Multiple and varied causes of coma
- Limited time availability for diagnosis & therapeutic judgement
- Adopt precise clinical and investigatory approach
- Supportive laboratory tests give indirect information and require time

Duty of a physician

- To arrive at a diagnosis
- To predict the prognosis as there is nothing more wasteful than exhausting resources in treating patients who will remain in a “persistent vegetative state”

Recognise the principle sub-causes

Metabolic

- drugs
- hypoglycaemia
- hypoxia
- trauma
- infection

Neurological

- vascular
- raised intra-cranial pressure/reduced cerebral blood flow
- epilepsy

Clinico-pathological approach

Common causes of coma

A) Localized mass lesions producing pressure effect

i. **Extradural hematoma**
ii. **Acute subdural hematoma**
iii. **Chronic subdural hematoma**
iv. **Cerebral contusion**
v. **Brain tumor**

B) Diffuse neuronal lesions

i. **Infections;** Meningitis
Encephalitis
Cerebral abscess
Sepsis
Cerebral malaria

ii. **Metabolic encephalopathies**; Diabetes mellitis
Hypoglycemia
Ketoacidosis
Hyperosmolar coma

iii. **Uremia**

iv. **Hepatic failure**; Viruses A, B, D & E,
Falciparum malaria
Typhoid
Paracetamol, isoniazid

v. **Myxoedema**

vi. **Drug overdose**

vii. **Haemorrhage (subarachnoid)**

viii. **Trauma (generalized brain oedema)**

xi. **Ischemia (anoxia)**

x. **Respiratory failure**

xi. **Alcohol abuse**

xii. **Others (Epilepsy, thiamine deficiency, psychiatric diseases)**

The unconscious patient-surgical sieve

- T - trauma -head injury, hypovolaemia
- I - infection -sepsis, meningitis
- N - neoplasia -SOL, metabolic complications

- D - doctors/drugs -anaesthesia, “recreational”
- E - endocrine -hypoglycaemia, Addison’s
- A - autoimmune
- D - degenerative

- M - metabolic -$K^{+,}$ Na^{2+}, Ca^{2+}, glu, O_2/CO_2
- I - idiopathic
- C - congenital -epilepsy
- E - endothelial /vascular -CVAs/TIAs/intracerebral bleeds

Clinical evaluation of the unconscious patient

History (from relatives, friends or witnesses

i. Onset of coma (abrupt, gradual)
ii. Recent complaints (headache, depression, focal weakness, vertigo)
iii. Previous medical illness (diabetes, uremia, heart disease)
iv. Access to drugs (sedatives, psychotropic drugs)

General physical examination

i. Vital signs
ii. Evidence of trauma
iii. Evidence of acute or chronic illness
iv. Evidence of drug ingestion (needle marks, alcohol breath)
v. Nuchal rigidity (examine with care)

Neurological examination with particular attention to

i. State of conciousness
ii. Respiratory pattern
iii. Pupillary size and pattern
iv. Eye movements
v. Motor responses

Investigations

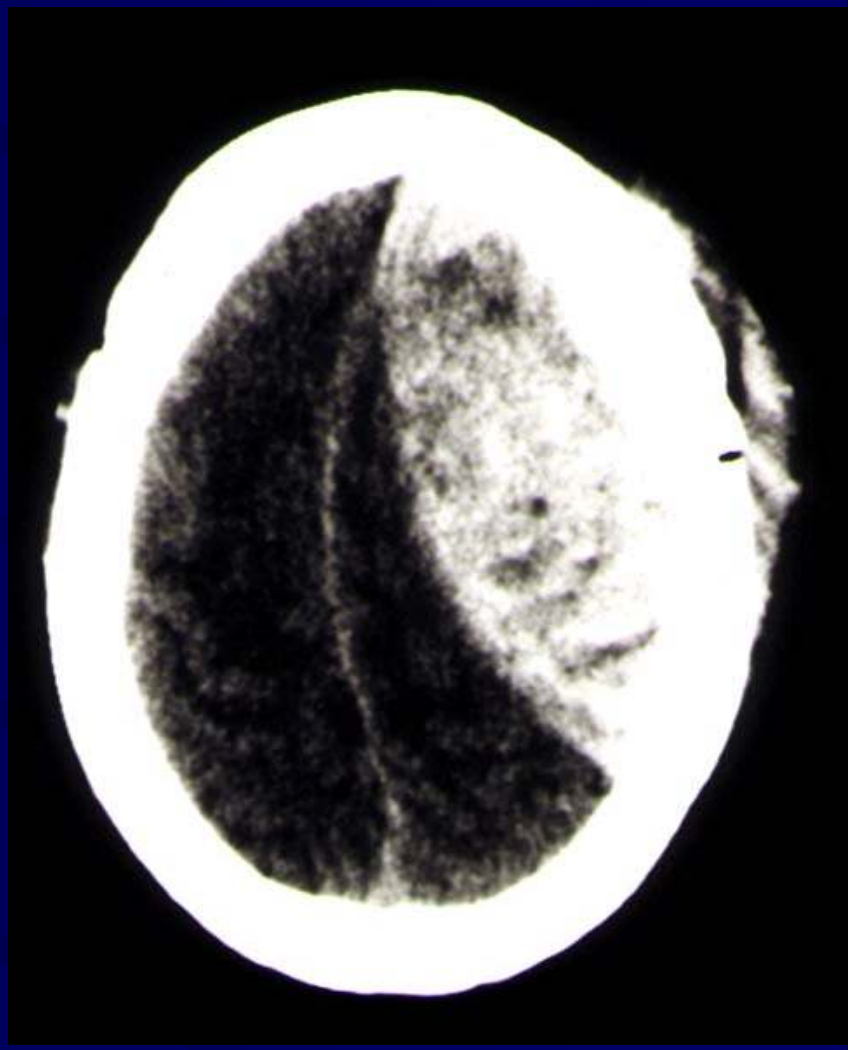
The investigatory scheme involves **Imaging studies** and **laboratory evaluation**. Choice of diagnostic investigation depends on suspected diagnosis.

Localized mass lesions & some diffuse brain lesions

- Skull X-ray
- CT scan
- Carotid angiography
- EEG
- Vertebral angiography
- Ventriculography

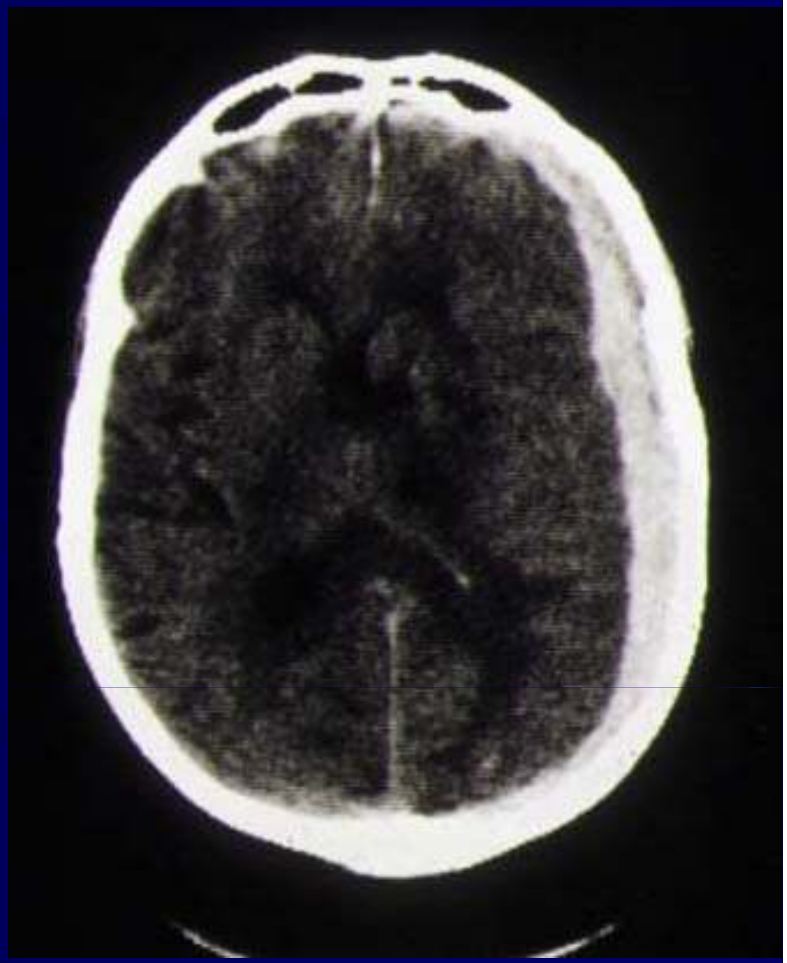
Extradural hematoma

- Haemorrhage between skull and dura mater
- Usually due to middle meningeal artery tear
- 95% have skull fracture



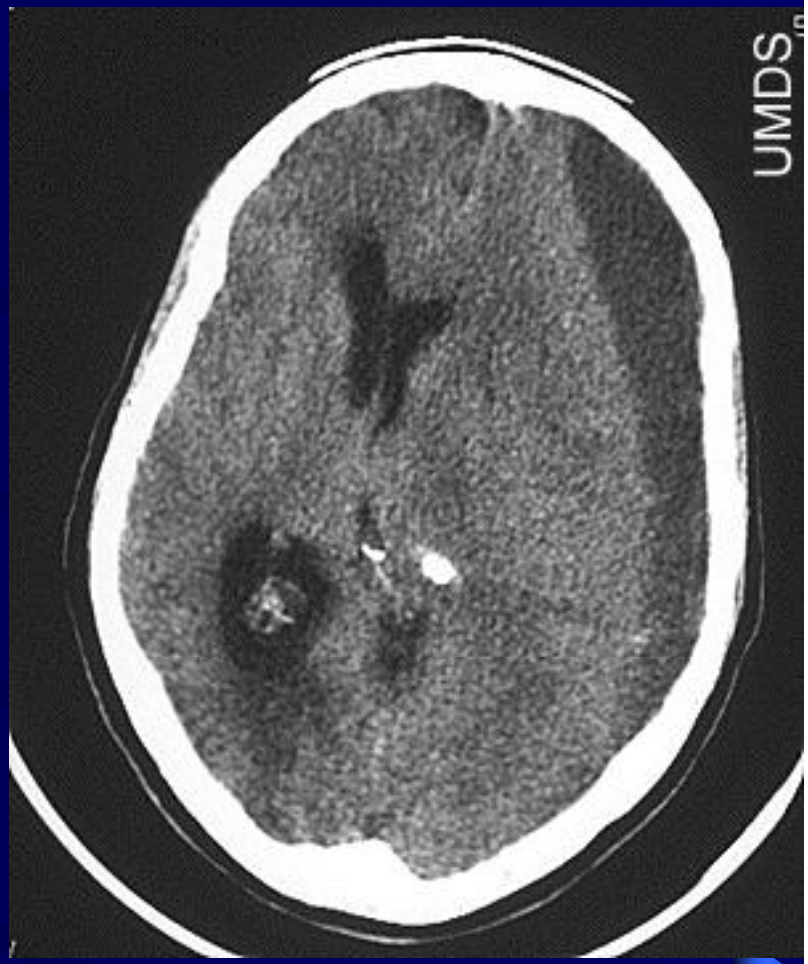
Acute subdural hematoma

- Haematoma between dura and brain
- Caused by sub-dural bridging vein tear
- Poor prognosis



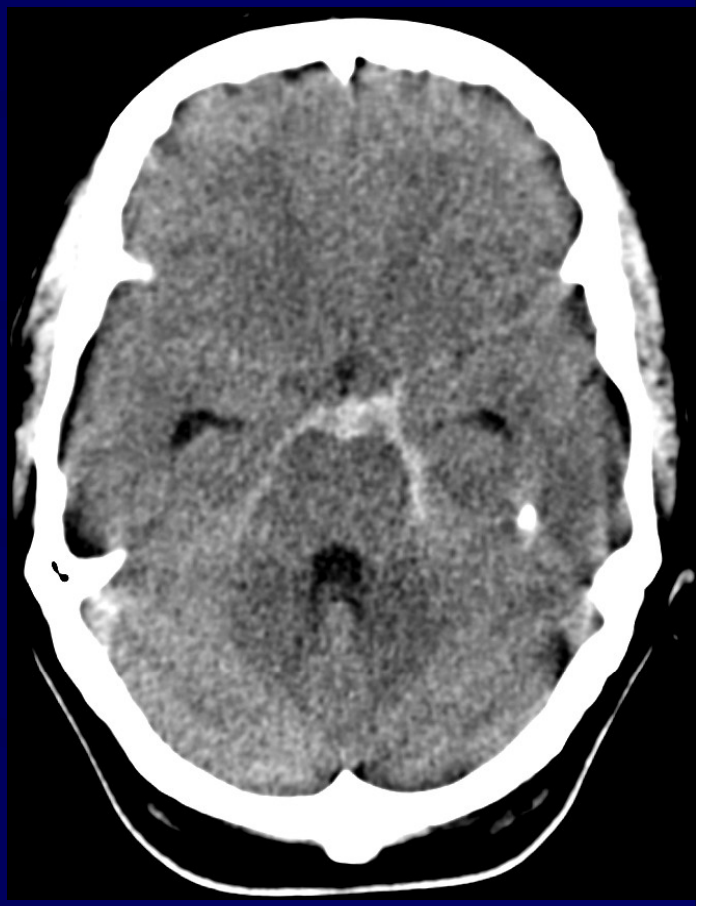
Chronic subdural hematoma

- Crescentic low density collection of a chronic sub-dural haematoma
- Note density change from acute SDH
- Note pressure effect with mid-line shift



Sub arachnoid hemorrhage

- Hyper intense central opacification of basal cisterns.
- Classical history ‘thunderclap headache’ and vomiting.
- Excluded by LP if not obvious on CT.
- Treated by neurosurgical intravascular coiling of aneurism.



Diffuse neuronal lesions

- Examination of CSF (cerebrospinal fluid)

  Contraindicated in presence of ↑ICP (intracranial mass lesions)
- Serum glucose, calcium, Na+, K+, magnesium
- Blood gases and pH
- Liver and renal functions
- Hormones (TSH, T4, cortisol)
- Drug levels
- Arterial blood gases

Hypoglycemia

Blood glucose < 3.5mmol/l (63mg/dl)

Causes; Isophane and Lenti insulins

Chlorpropamide

Non-diabetic spontaneous hypoglycemia

Blood glucose < 3mmol/l (54mg/dl)

Causes; Alcohol, drugs (salicylates, quinine)

Liver and kidney failure

Malaria

Endocrine hypo function

Inborn metabolic errors

Mechanism; impaired gluconeogenesis. ↓Glycogenolysis

Investigations: Serum glucose, C-peptide level, Insulin level

↑Insulin ↓C peptide (Exogenous insulin)

↑Insulin ↑C peptide (Insulinoma, sulphonylureas)

↓Insulin ↓C peptide (drugs, other illnesses)

Hyperglycemia (Non-ketotic)

Blood glucose >50mmol/l(900mg/dl)

Severe dehydration

Pre-renal uremia

Investigations; Blood glucose, Blood osmolality (measurement) or by formula

Osmolality; 2[Na+]+2[K+]+[glucose]+[urea]

Blood osmolality in coma >340mmol/kg

(Normal value 280-300mmol/kg)

Hyperglycemia (Ketotic)

Smell of acetone, hypothermia, confusion, drowsiness, coma, air hunger (kussmaul breathing)

Investigations; Blood glucose, urea, electrolytes, HCO3

$HCO_3 < 12mmol/l$ (Normal value 22-32mmol/l)

Arterial blood gases

Urine for ketones

Cerebral malaria (falciparum malaria) coma

S/S; Hyperpyrexia
Convulsions
Coma
Marked anemia
Renal failure
Hepatic failure
Hypoglycemia
Acidosis
Pulmonary edema.
Hyperparasitemia>10% RBCs have parasites

Myxoedema coma

Investigations; TSH, T4, Cortisol
CSF; ↑protein
CSF; ↑pressure
Thyroid scan; goiter

Hepatic coma

Investigations; ↑↑ AST, ↑ Bilirubin, ↓ Prothrombin, ↓ Factor V
↑ NH3 levels (inc. sensitivity to dietary proteins)
↑ Glutamic acid 2-oxoglutamate in brain
↑ Short and medium chain fatty acids
↑ Captans in plasma (fetor hepaticus)
↓ Leucine, isoleucine, valine

Uremic coma

Investigations; FBG, Smear, Clotting screen
Urea, creatinine, electrolytes
Urine microscopy (dysmorphic RBCs)-casts
Urine protein
Blood cultures
CRP (ESR is misleading in ARF)
Ig & Protein electrophoresis, ACNA, Anti GBM, ANA (Unknown diagnosis)

Coma in respiratory failure

Investigations; Arterial blood gases paO2 and Pco2

HCO3 level

pH level

Aim; To keep PaO2 > 7kpa (52mmHg) & PCO2 < 5kpa (37mmHg)

Type I; PaO2 < 8kpa (60mmHg)

PCo2 < 6.6kpa (50mmHg)

Causes ⟶ Acute: Acute severe asthma — Chronic: Emphysema

Pulmonary oedema — Lung fibrosis

Brain stem lesions — Right to left shunt

Type II; PaO2 < 8kpa (60mmHg)

PCo2 > 6.6kpa (50mmHg)

Causes ⟶ Acute: Acute severe asthma — Chronic: COPD

Acute flare-up COPD — Sleep apnea

Acute neuropathies — Myopathies

Narcotic drugs

Drug overdose coma

Qualitative screening of urine; Urine-immunofluorescence
Urine-spot test for drugs

Urine immunofluroescence is used for:

Benzodiazepines
Cocaine
Opioids-Narcotics
Canabis
Amphetamines

Drawbacks; cannot detect fentanyl derivatives, tramadol & synthetic opioids

Spot colour test is used for:

Acetaminophen
Salicylates
Phenothiazines
Imipramine and analogues
Ethchlorovynol

Different separation techniques (TLC, GC, HPLC) are used for screening of a broad range of drugs. For confirmation of presumptive positive test a quantitative drug measurement is performed using G-C-MS (Gas chromatography mass spectroscopy)

Hypoxic coma

Hypoxaemic hypoxia;
low PaO_2 in blood due to poor ventilation e.g. CCF

Anaemic hypoxia;
normal PaO_2 but low Hb e.g. bleeding

Primary hypoxia;
failure to deliver O_2 e.g. Methaemaglobin or CO poisoning

Ischaemic hypoxia;
cerebral ischaemia / ischaemic heart disease

Management of comatose patient

- Maintain adequate cerebral oxygenation; patent airway, assisted respiration if necessary
- Prevent aspiration. Nursing the patient on the side and empty the stomach
- Establish an intravenous line for prompt medication e.g. IV glucose/insulin, high dose steroid, anticonvulsants

CASE NO I:

A female patient aged 50 years, was brought to emergency department in Coma, after 5 hours drive from a village. Her blood pressure was 145/80 temperature was normal. The attendants gave history of fever, body aches pains and diarrhea for 7 days O/E her mouth was deviated slightly to right side.

Her TLC was	1200/ul
Hb	12.4
RBG	35mg/dl
Blood urea	35mg/dl

What further investigation will you carry to reach a final diagnosis.

CASE NO II:

A 19 years old man was brought to emergency department in Coma. According to history by the attendant he presented with a terrible headache the worse he had even had, nausea and vomiting with sudden onset. According to him it started after having sex with her partner. He takes no medicines, is usually very fit and well with an un-remarkable PMH. Comment on your plan of investigations for final diagnosis.

CASE NO III:

During midnight 69 years old man was brought by his sons to emergency department. He had been unwell, he had a slurred speech. He was neglecting his left side and unable to move his arm and leg. The sons told that his father is a smoker and that he has blood pressure.

Your plan of investigations to reach the final diagnosis

THANK YOU