

## Neurological Emergencies

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A 75 year-old man is brought to the ER by ambulance. During breakfast one hour ago, his right upper limb became weak, his right lower face sagged, and he could only mumble short words or phrases, but understood those speaking to him. He has hypertension and diabetes. BP 170/100, pulse 76/min, RR 12, afebrile.

**After verifying his history and current medications, what should be checked first in the ER?**

**How would you manage his nutrition or IV fluids?**

**Do you order a CT or MRI brain scan?**

**Is he a candidate for IV tPA?**

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## Acute stroke syndrome

- **A-B-C's**
  - NPO, intubate for inadequate airway, ventilate if needed
  - Correct hypotension, rule out acute MI or arrhythmia (a-fib)
- Rule out hypoglycemia
- Minimize hyperglycemia by running an IV of 0.9% normal saline initially at a TKO rate
- Use parenteral antihypertensive Tx only for sustained, very high BP (>220/120; or >185/110 for IV tPA)
- Evaluate patient for use of IV tPA
- Decide on when to get a brain scan (which type?)

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### Acute stroke syndrome: IV tPA

- IV tPA must be given within 3 hrs of stroke onset
- Neuro deficit (NIHSS score 5 to 22) must not be rapidly improving (TIA) or post-ictal
- BP maintained under 185/110
- Normal PTT,  $PT \leq 15$  sec, platelets  $\geq 100,000$
- No blood, or edema/infarct  $> 1/3$  of MCA territory on CT
- No bleeding, recent surgery, MI, arterial puncture or LP
- Blood glucose is between 50 and 400 mg/dl

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### Acute stroke syndrome: what scan & when?

- CT scan
  - in deteriorating patient, quickly rules out hemorrhage, mass (tumor, abscess) or early infarct edema
  - shows cortical infarcts by 1-2 days, may miss lacunes
- MRI scan
  - highest resolution scan, but longer scanning time
  - DWI (diffusion weighted imaging) detects impaired movement of water in infarct immediately
  - non-invasively view arterial supply (MRA)
  - contraindications: pacemaker

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### Acute stroke syndrome: anticoagulation

- Anticoagulation (heparin; warfarin: INR 2.5) is indicated in select cases:
  - Atrial fibrillation\*
  - Carotid or vertebral dissection\*\*
  - Cerebral sinus (venous) thrombosis\*\*
  - Hypercoagulable states\*
- Anticoagulation is withheld 5-7 days or more in presence of larger, or hemorrhagic, infarcts
- Goal of preventing future infarcts\*, perhaps clot extension\*\*

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A 75 year-old man is verbally unresponsive in the ER, moving only his left limbs to painful stimuli. BP is 210/106, pulse 85/min and afebrile. His lip is bleeding and there is blood in his Foley (urinary) collection bag.

He gradually becomes even less responsive.

**What do you do?**  
**What do you order?**

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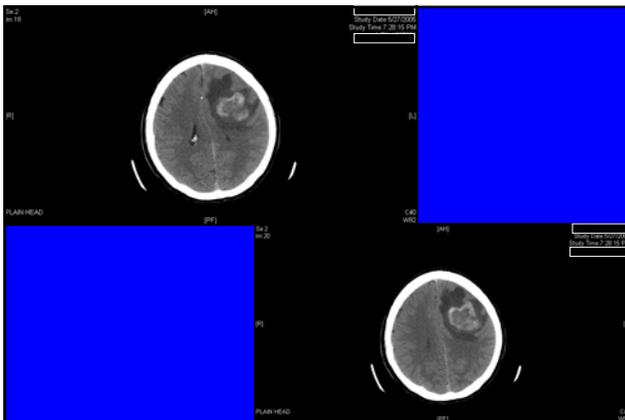
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### Increased intracranial pressure

- General medical treatment of increased ICP:
  - Hyperventilation ( $pCO_2 < 25$  mm)
  - Mannitol (0.25 gm/kg q6 hrs if  $S_{osm} < 310$ )
- Specific treatment of increased ICP:
  - Tumor, encephalitis, abscess: dexamethasone 4 mg IV q6 hrs
  - Acute hydrocephalus: shunt
  - Pseudotumor cerebri: acetazolamide PO, optic nerve fenestration or lumboperitoneal shunt

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## Increased intracranial pressure

- Treatment of intracranial hemorrhage:
  - Surgical: remove epidural or subdural hematoma, progressive cerebellar hemorrhage, rarely an intracerebral hemorrhage (in the latter, a ventriculostomy drain may be inserted)
  - Medical: find and treat any uncontrolled HTN or bleeding disorder; general medical Tx of ICP (see previous)

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A 32 year-old woman is found on the floor at work, unconscious, but spontaneously breathing. In the ER, BP is 146/75, pulse 80, afebrile. Her left pupil is 5 mm and sluggishly reacts to light; the right pupil is 2 mm and briskly reacts to light. She does not grimace or move to painful stimuli, nor attempt to speak.

**Which findings on physical exam are significant? Why? What do you do? What do you order?**

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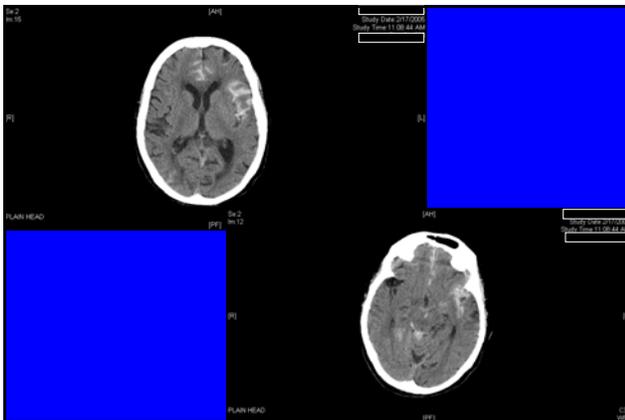
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**Coma: subarachnoid hemorrhage**

- Berry aneurysm commonest if no trauma
- Verify blood by CT, or LP if CT normal
- Emergent angio and neurosurgical clipping
- Treat vasospasm with
  - “Triple H:” Hypertension, Hypervolemia, Hemodilution after aneurysm clipped
  - Nimodipine 60 mg PO (NG) q4 hrs x 21 days
- Coils may be placed into inoperable aneurysms

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**Coma: bedside exam of patient**

- Motor responsiveness or posturing
  
- Respiratory pattern
  
- Pupils
  
- Reflexive eye movements

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**Coma: motor responsiveness**

- Encouraging responses to pain stimuli:
  - arousal, verbalization
  - localization and avoidance of stimulus
- Decorticate posturing (flexion of arm(s), extension of leg(s)): cortical level
- Decerebrate posturing (extension of arm(s) and leg(s)): midbrain level
- Myoclonic jerks: metabolic/anoxic state

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## Coma: respiratory pattern

- Cheyne-Stokes (crescendo-decrescendo)
  - often seen in sick elderly, or CHF patients
  - can reflect bilateral cerebral problem
- Patterns may not localize “classically”
- Ataxic, irregular breaths
  - preterminal pattern preceding respiratory arrest, when dysfunction at level of medullary respiratory center

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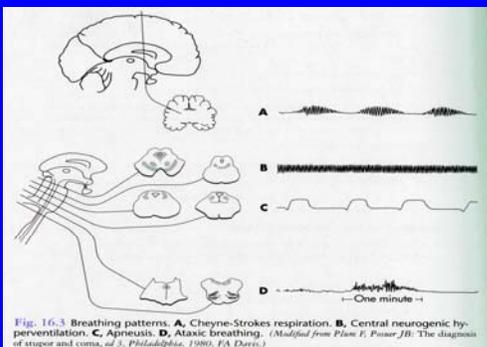


Fig. 16-3 Breathing patterns. **A**, Cheyne-Stokes respiration. **B**, Central neurogenic hyperventilation. **C**, Apneusis. **D**, Ataxic breathing. (Modified from Plum F, Posner JB: The diagnosis of stupor and coma, ed 3, Philadelphia, 1980, FA Davis.)

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## Coma: pupil size and reactivity

- Smaller, reactive pupils persist in metabolic coma
- Larger, unreactive pupil(s) reflect third cranial nerve or midbrain lesion
- Pinpoint, reactive pupils from pontine lesion (or narcotic overdose)
- Medicinal eyedrops may impair light reflex

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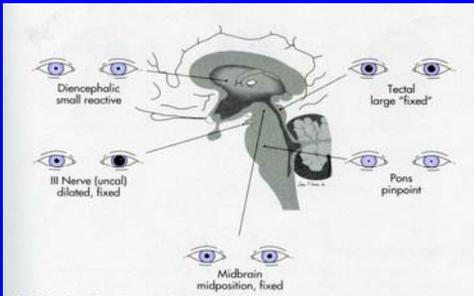


Fig. 16.4 Pupillary abnormalities in coma. (From Plum F, Posner JB: The diagnosis of stupor and coma, ed 3, Philadelphia, 1980, FA Davis.)

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### Coma: Reflexive eye movements

- Oculocephalic (doll's eyes) reflex:
  - eyes roll opposite to lateral turn of head
- Oculovestibular (cold caloric) reflex:
  - eyes slowly deviate toward "cold ear"
- May be "falsely" absent in presence of
  - vestibulotoxic drugs (benzodiazepines, barbiturates, aminoglycosides)
  - previous otic disease

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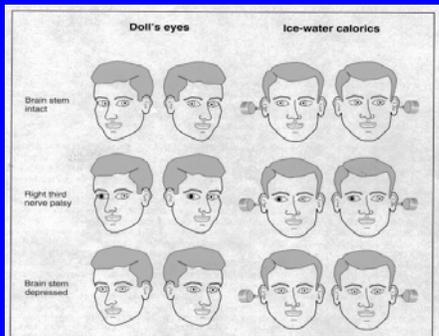
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(modified from Collins RC: Neurology, Philadelphia, 1997, WB Saunders)

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## Coma: clinical guidelines

- Structural lesions causing coma
  - Asymmetrical motor, reflex or pupillary findings, preceding mental status changes
- Metabolic conditions causing coma
  - Mental status changes precede symmetrical motor or reflex findings
  - Pupillary light reflex relatively preserved
  - Myoclonic jerks, tremor, asterixis typical

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## Coma: emergent care

- Ensure adequate "A-B-Cs" (also rule out primary cardiopulmonary cause of coma)
- Immediately rule out hypoglycemia, or give 50% dextrose IV
- Urgent, noncontrast brain CT (rule out blood or edema) if head trauma or focal neuro deficit
- Correct any hypothermia
- Check metabolic panel, drug screens, carbon monoxide toxicity?
- If febrile, consider LP for meningoencephalitis (what are the indications? The contraindications?)

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A 45 year-old man, who had a generalized convulsion in a local restaurant, is brought to the ER by the paramedics. The seizure spontaneously stops in the ambulance, but he remains unresponsive. After arriving in the ER, he has a 15 minute generalized convulsion. During your examination, he is unresponsive to pain, and rhythmical jerking of his limbs starts up again.

**What information do you wish you had?  
What do you do? What do you order?**

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### Status epilepticus: treatment (1)

- Maintain A-B-C's at onset and during therapy
- EKG and oximeter monitoring
- Start IV access (saline), draw CBC, lytes, glucose, BUN, creat, AST, ALT, ? anticonvulsant levels
- Rule out hypoglycemia with fingerstick, or give 50% dextrose bolus urgently
- Send toxicology screen on urine or blood

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### Status epilepticus: treatment (2)

- Lorazepam 0.05-0.1 mg/kg IVP (<2 mg/min) or diazepam 0.15-0.25 mg/kg IVP (<5 mg/min)
- Load phenytoin 20 mg/kg (IV saline) (<50 mg/min), or fosphenytoin 20 (PE) phenytoin equivalents/kg IV (<150 mg/min)
  - (fosphenytoin, a prodrug of phenytoin, has less risk of hypotension, arrhythmia and skin reactions than phenytoin given IV)

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### Status epilepticus: treatment (3)

- If seizures persist, give 1 or 2 extra boluses of 5 mg/kg phenytoin or 5 PE/kg fosphenytoin IV
- If more seizures, load phenobarbital 20 mg/kg IV (<50 mg/min)
- Intubation & ventilation may be needed now
- Check that anticonvulsant levels are therapeutic
- Emergent EEG if patient doesn't wake up

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**Refractory status epilepticus: therapy**

- Midazolam 0.2 mg/kg IV bolus, then 0.75 to 10 microgm/kg/min infusion, or
- Propofol 1 mg/kg IV bolus (can repeat), then 1-15 mg/kg/hr infusion, or
- Pentobarbital 5-15 mg/kg loading dose, then 0.5-5 mg/kg/hr
- Suppress electrical seizure activity on continuous EEG monitoring, watch for hypotension

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**Generalized status epilepticus (GSE)**

- As GSE persists longer, motor movements become more subtle, and control more difficult
- Survivors may have cognitive or memory loss
- Mortality related to pt age, cause and duration of GSE
- Evaluate cause of GSE once seizures controlled: LP, CT or MRI brain scan

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A 73 year-old man is found on the floor of his apartment, awake but unable to get up after falling down. He has been feeling weaker and stumbling more this past week.

**What specific neurological symptoms or signs would help localize the lesion for his weakness?**

**What would you do?  
What other diagnostic testing would be useful, if your test of choice is unavailable or contraindicated?**

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## Acute or subacute para/quadriparesis

- Brainstem infarction
  - Paralysis of face, extraocular ms, "crossed brainstem syndromes," brisk reflexes
- Myelopathy (spinal cord lesion)
  - Back or neck pain, level of sensory loss, urinary retention/incontinence, brisk reflexes (traumatic spinal shock: decreased reflexes)
- Guillain-Barre syndrome
  - May involve cranial ns, NO level of sensory loss, normal sphincters, areflexia
- Myasthenic crisis or botulism
  - normal reflexes and sensation, ptosis, bulbar weakness

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cervical spine MRI (T2)

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cervical spine MRI (T2)

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### **Metastatic spinal cord compression**

- Vertebral (thor>LS>cerv) metastasis expands
- Usually back (or neck) spine pain initially present
- Poor recovery if severe paralysis already exists
- Is a primary cancer pre-existent?
- Dexamethasone (10 mg), 4 mg IV q6 hrs
- Surgery/radiotherapy vs radiotherapy

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