

Coma

Medical Student Lecture

Definition of Coma

- ◆ Eyes closed unresponsiveness
- ◆ Glasgow coma score of less than 10
 - Eye opening 1-4
 - Verbal 1-5
 - Motor 1-6

Etiologies of coma

- ◆ Drug Overdose: Mortality 5-10%
- ◆ Metabolic: Mortality 50%
- ◆ Head Trauma: Mortality 50%
- ◆ Anoxia: Mortality 90%
- ◆ Stroke: Mortality 80%

Levels of altered mental status/coma

- ◆ Delirium-confusional state, may be marked by agitation or lethargy or waxing and waning mental status
 - Drug induced delirium
 - hypoxia

Levels of altered mental status/coma

◆ Obtundation

- Lethargic, blunted cognition
- Awake but somnolent or slowed
- Arousable

◆ Stupor

- Asleep/semi comatose
- Only arouses when stimulated
- Reverts back to sleep when stimulus withdrawn

◆ Coma-eyes closed, unresponsive

Glasgow Coma Scale 3-15

◆ Eye Opening

- Never 1
- To pain 2
- To verbal 3
- Spontaneous 4

◆ Best Verbal Response

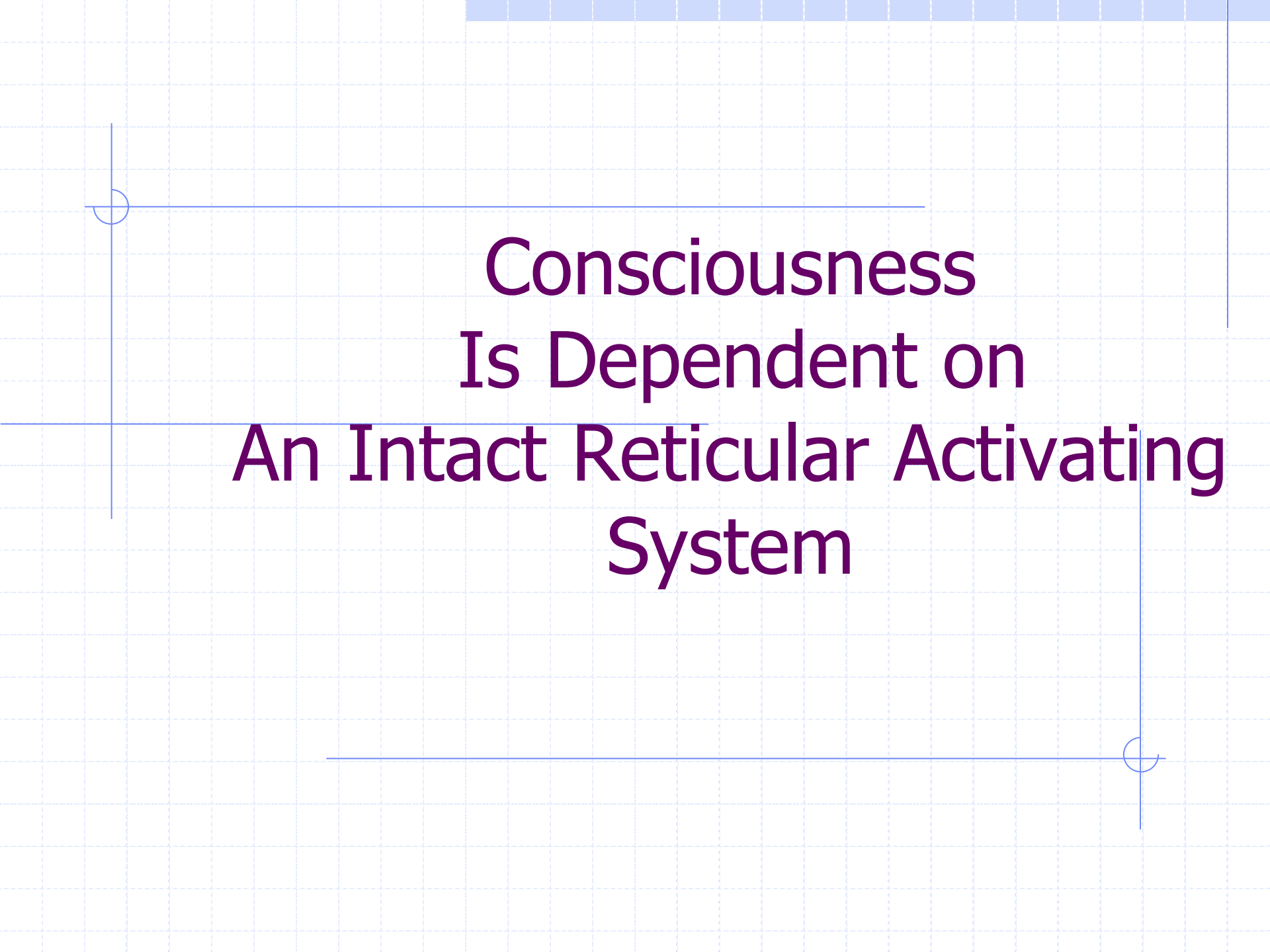
- None 1
- Sounds 2
- Inapp words 3
- disoriented 4
- oriented 5

◆ Best Motor Response

- None 1
- Extensor 2
- Flexor Posture 3
- Withdrawal 4
- Localization 5
- obeys 6

Mechanism of Stupor/Coma

- ◆ Brainstem lesion or dysfunction
 - Reticular Activating System in pons and midbrain
 - Eg: stroke, bleed, compression, anoxia
- ◆ Bilateral acute cortical dysfunction/injury
 - Eg: anoxia, seizures, trauma
- ◆ Bilateral Thalamic lesion
 - Eg: anoxia, trauma, bleed



**Consciousness
Is Dependent on
An Intact Reticular Activating
System**

The RAS and Essential Neurotransmitters

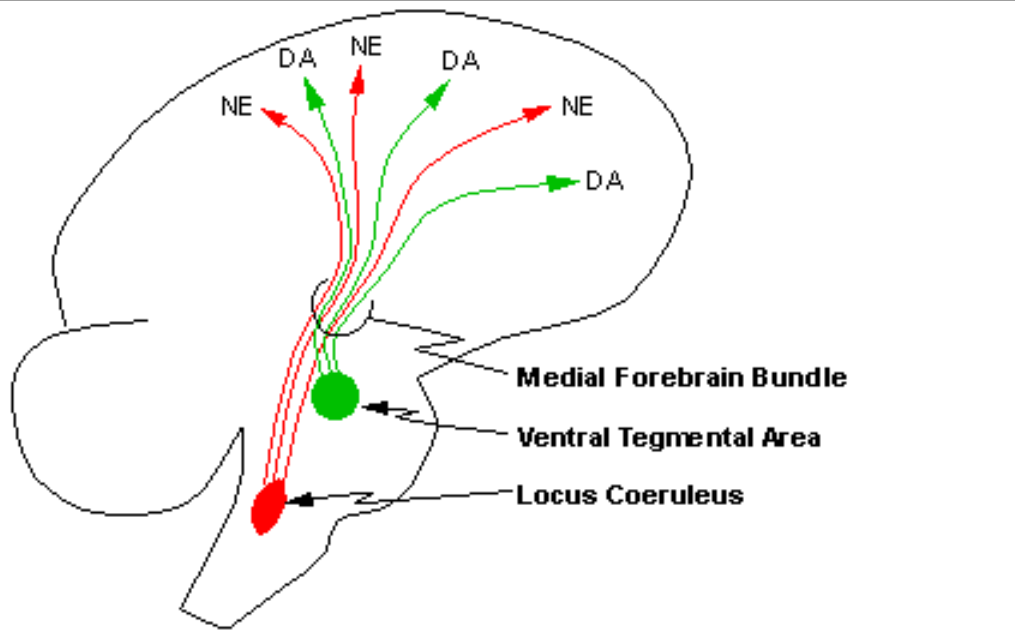
Epinephrine Locus Coeruleus

Serotonin: Median Raphe

Acetylcholine: Basal Nucleus

Figure 6 - 4

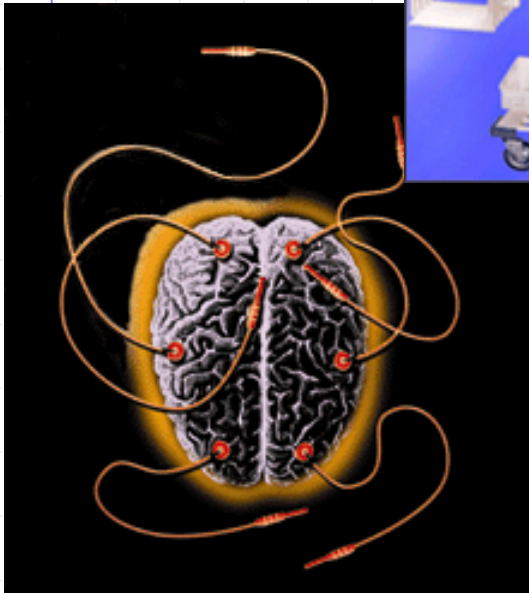
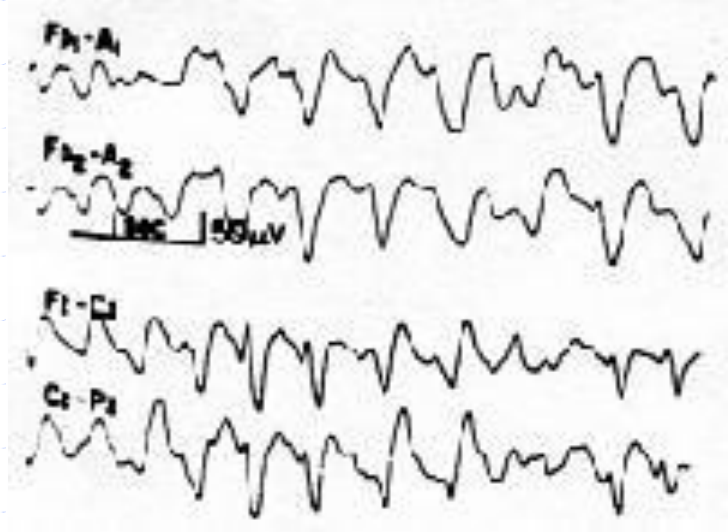
Hamilton - Timmons



Name the cause?



EEG in hepatic coma?



Initial Neurological exam: Primary Question

Is the coma due to a

- ★ Toxic infectious, Metabolic Coma

or

- ★ Acute Neurosurgical Cause

- ◆ Bleed

- ◆ Neoplasm

- ◆ Infection

- ◆ Increased Intracranial pressure

Exam points

◆ Nuchal rigidity

- Sub arachnoid hemorrhage
- Meningitis

◆ Rash-

- meningococcus,
- Spiders
- Drug reaction

◆ Ecchymosis over orbit or mastoid

◆ Papilledema



Initial Exam

- Pupils-Unilateral Dilated Pupil-R/o herniation
- Fundi-r/o Papilledema
- Corneals, Oculocephalic
- Motor response
 - ◆ Withdrawal
 - ◆ Decortication
 - ◆ Decerebration
- Progression suggests
 - ◆ Expanding or worsening mass

Metabolic Coma

- ◆ Signs and symptoms of toxic - metabolic coma
 - Pupils small-narcotics
 - Pupils large-Tricyclics
 - Nystagmus-Dilantin, PCP
 - Respiratory depression-narcotics
 - Tremor/asterixis-uremia, ETOH, hepatic

Etiologies-toxic metabolic

◆ Drug overdose

- ◆ Narcotics, Tricyclics, Stimulants

◆ Metabolic

- ◆ Sepsis
- ◆ Hepatic encephalopathy
- ◆ Uremic encephalopathy
- ◆ Hypoglycemia
- ◆ Hypothyroidism
- ◆ ETOH withdrawal/intoxication

Initial Management

- ◆ Protect airway- Support vitals
- ◆ If evidence of trauma, immobilize spine, get stat c-spine
- ◆ IV, Pulse ox, frequent vitals and neurochecks
- ◆ Intubate if GCS < 10 or if any question of ability to protect airway
- ◆ Stat
 - fingerstick for dextrose
 - CBC, electrolytes, BUN/Cr, Calcium, ABG, LFT's, ammonia, UA, serum and urine tox screen, blood cultures if febrile
- ◆ Dextrose (1 amp = 25 grams dextrose)
 - Always follow with Thiamine 100 mg IM
 - ◆ Improves recovery of Wernickes, if delayed, increased risk of Korsakoffs

Initial Management

◆ If Narcotic OD suspected, give

- Naloxone 1 - 2 amps
- repeat in 15 minutes

◆ If benzodiazepine overdose suspected,

- Flumazenil .2 mg
- repeat q 1 minute up to 1.0 mg, may produce seizures.

◆ If ETOH withdrawal (72-96 hrs post ETOH)

- (confusion, hallucinations, tremor, tachycardia, HTN)
- Thiamine 100 mg/IM
- Librium 25-100 mg q6hrs

◆ For ETOH seizures

- (12-24 hours post withdrawal)
 - ◆ Give thiamine 100mg
 - ◆ Stat fingerstick for dextrose
 - ◆ Lorazepam 2 mg IV q 6-8 hours

If bacterial meningitis or SAH suspected

- ◆ For SAH, STAT CT of brain
 - 90% yield for SAH
 - Notify neurosurgery stat if suspected
- ◆ If bacterial meningitis suspected, do not delay for CT-
Start empiric therapy
 - Ceftriaxone 2 grams q12 hours IV
 - Vancomycin 750-1000 mg q 12 hours IV
 - Ampicillin 2 grams q 4 hours IV age > 65 or if immunocompromised
- ◆ LP: L3-L4 interspace
 - Obtain opening pressure
 - Cell count tubes 1 and 4
 - Tubes 2 and 3, Gram stain, Cocci, AFB, india ink,
 - Protein and glucose

Signs of increased ICP/Herniation

◆ Pupils

- Unilateral dilated pupil is a sign of?
- Bilateral small poorly reactive pupils are a sign of?

◆ Eye movements

- Third nerve palsy?
- Sixth nerve palsy?
- Can be assessed by cold caloric

◆ Fundoscopy

- Signs of Papilledema?

◆ Respiratory pattern?

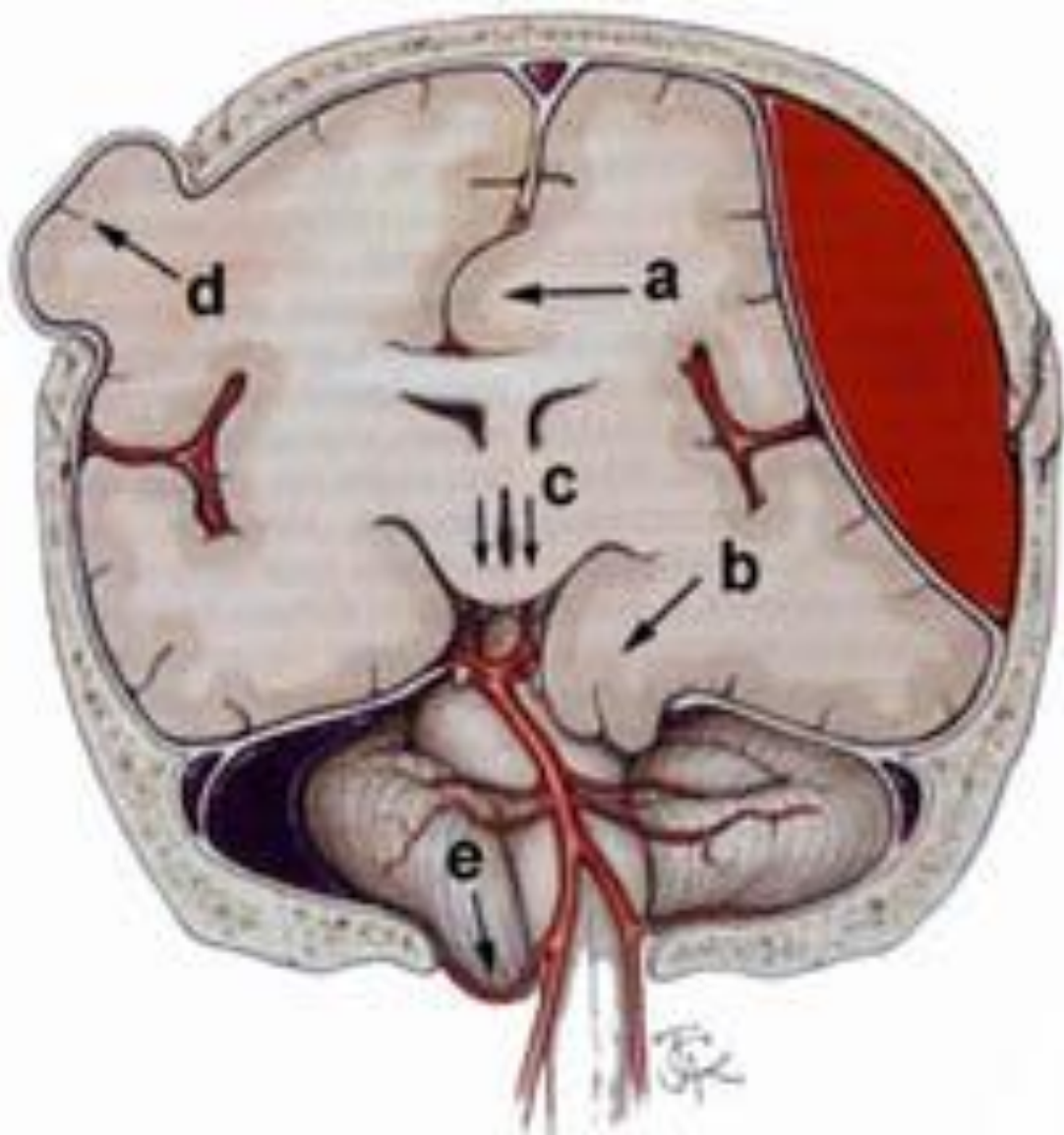
Signs of herniation (cont'd)

Can be detected by a deterioration in mental status, pupils, or motor exam

- Withdrawal to pain transitioning to flexor withdrawal
- Flexor withdrawal to extensor posturing
 - ◆ Decortication-Flexor withdrawal-lesion above red nucleus
 - ◆ Decerebration-Extensor posturing-lesion below red nucleus

Papilledema-a sign of increased ICP



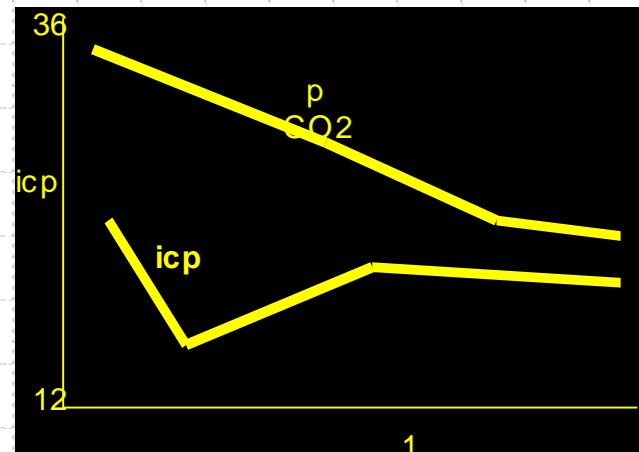


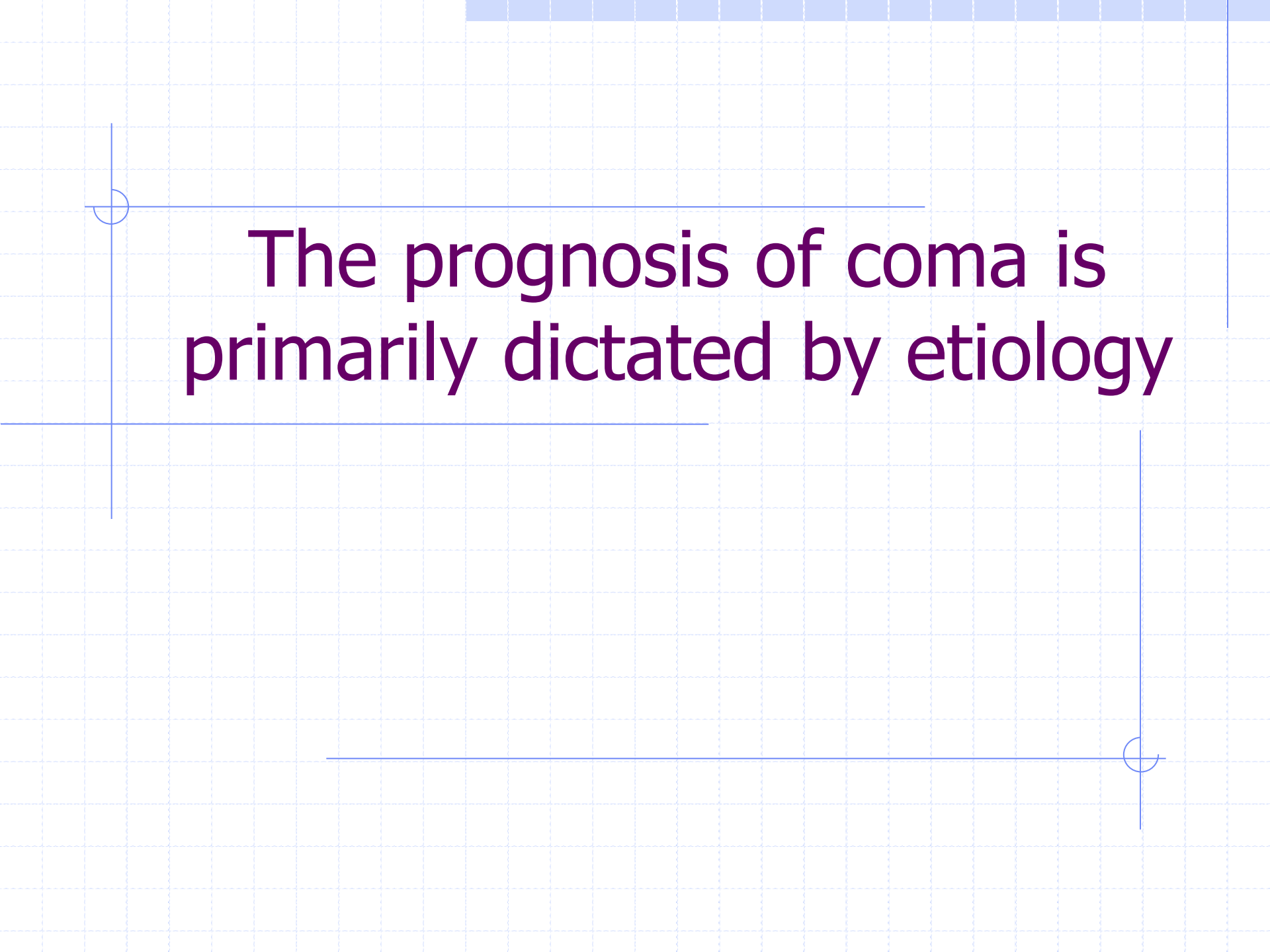
Increased ICP

- ◆ Hyperventilation: Reduces ICP immediately, peak effect 1-2 hours
 - NO BENEFIT TO drop $PCO_2 < 25$, Ideal = 30
- ◆ Mannitol: Onset in 30 minutes lasts 4-6 hours
- ◆ Mannitol and lasix are synergistic.
 - 1 - 2 grams/kg bolus
 - 0.5 - 1 gram/kg q 6 hours
 - Monitor sodium, osmolality, BUN, carefully

Increased Intracranial Pressure: Hyperventilation

- ◆ Hyperventilation reduces ICP acutely, but ICP returns to baseline within 1-2 hours
- ◆ Reduction of CO₂ beyond a p CO₂ of 30 has little benefit





The prognosis of coma is primarily dictated by etiology

Predictors of Awakening/Good Outcome

EEG:

- ◆ Strong predictor only for poor outcome in coma- 0/138 good recovery if:
 - burst suppression
 - low voltage
 - PLEDS

EP's: Median Nerve

- ◆ Strong Predictor only of poor outcome
- ◆ Absent cortical potential to median nerve stimulation (N20)
- ◆ poor prognosis >95%