Respiratory Insufficiency Secondary to Neurologic Disorders

Ma, Cline: ch. 147 ; 148

Brady pp 598;

(+/or other standard paramedic text)

Objectives

- At the conclusion of this lecture, you will be able to discuss
- some of the causes of respiratory insufficiency that are much less common than
  - Trauma
  - Stroke
  - Drugs
- some less common causes such as
  - Acute Neurologic Disorders (Botulism)
  - Chronic Neurologic Disorders (MS)

Respiratory Insufficiency Secondary to Neurologic Disorders

- Acute Neurologic Disorders
  - Spinal Cord Dysfunction
  - Infection and Toxin
  - Vasculitis
  - Tumors
- Chronic Neurologic Disorders
  - ALS (Lou Gehrig's Disease)
  - Multiple Sclerosis
  - Myasthenia Gravis

Respiratory Muscle Failure

- Respiratory insufficiency results from:
- Paralysis involving cervical or thoracic level spinal nerves
  - Onset may be delayed days; eventual fatigue
- Weakness of respiratory muscles

Acute Neurologic Disorders Causing Respiratory Insufficiency

- Spinal Cord Dysfunction
  - Guillain-Barré syndrome
  - Spinal cord tumors
- Tumor mass
- Infection / toxin
  - Botulism
- Vasculitis
  - Lupus

Spinal Cord Compression

- Etiology
  - Primary CNS tumor
- Hx
  - Pain first symptom of spinal cord compression
  - may occur hrs or months prior to dysfunction
  - exacerbated when the patient is recumbent
  - improves with the patient in the upright position
    - This pattern of pain is opposite of herniated disc

Acute Spinal Cord Compression Treatment

- Requires rapid intervention
- Corticosteroids
- Radiation
- +/- surgery (decompressive laminectomy)
- +/- chemotherapy

Cerebral Herniation

- As with hemorrhage and infarction
- Herniation may also be caused by
  - Tumor mass
  - Thrombosis
  - Abscess
- Classic impending herniation clinical findings
  - Impaired consciousness
  - Abnormal extraocular movements
  - Unequal pupil size abnormality
  - Cushing reflex (late sign)
    - hypertension
    - bradycardia

Cerebral Herniation Treatment

- Herniation (tumor, thrombosis, abscess):
- Drop the PCO2 to 30-35 mm Hg
  - to induce vasoconstriction
    - subsequent decrease in cerebral blood volume.
- Mannitol 20% sol 1 g/kg IV over 20 min.
- Dexamethasone 10mg IV
  - for ICP resulting from intracranial tumor or abscess

Guillain-Barré Syndrome

- GB (acute demyelinating polyneuropathy)
- areflexic ***ascending*** paralysis
- with no sensory loss at that level pain often accompanying the motor loss Immediate treatment for life threatening Guillain-Barré syndrome

Etiology of Guillain-Barré

- Unknown. Possible autoimmune disorder
- Occurs a few days or weeks after
- After respiratory or GI viral infection
- Other
  - Surgery
  - Trauma
  - Reaction to vaccination
  - Spider bite

Diagnosis and Prognosis of Guillain-Barré

- Diagnosis
  - Sudden onset of specific symptoms
  - Highly specific exam
  - Tests
    - Lumbar puncture : high protein
- Prognosis
  - Usually reversible, but can be life threatening
  - Recovery often begins within a few wks
  - Requires immediate intensive care and monitoring
  - Key to treating GBS : early detection
    - no cure ; prevent complications

Guillain-Barré Treatment

- Ventilatory support
- Plasmapheresis
  - – Procedure removes abnormal antibodies
  - – Replaces blood (with normal antibodies)
  - – Reduces severity and duration
- May administer high-dose IV immunoglobulins
  - to fight possible invading organism

Botulism

Pathophysiology

- *C botulinum* spore-forming anaerobe
- Naturally inhabits soil
  - – in fresh and cooked agricultural products
- Food-borne botulism is not seen after eating fresh foods
  - – Some methods of food preparation, such as home canning, produce an anaerobic, low-acid (ie, pH >4.6)
- *C botulinum* spores can germinate in GI of infants younger than 1 year (relative lack of gastric acid and decreased levels of normal flora)

Botulism Symptoms

Adult food-borne botulism

- Upper and lower GI tract symptoms early
  - – beginning 18-36 hrs after ingestion
  - – UGI
    - *Dysphagia*
    - Nausea, vomiting
  - – LGI
    - Diarrhea followed by constipation
- Motor function symptoms follow
  - – *Diplopia*
    - Cranial nerves usually affected first (lateral gaze)

Botulism Signs

- Afebrile
- Sensation intact
- LOC remains intact
- Pure motor loss
  - – Rapidly progressive ***descending*** paralysis
- Signs of autonomic dysfunction
  - – Orthostatic hypotension
  - – Abdominal distension +/- tenderness
    - urinary retention
    - constipation

Infant Botulism

- Incubation period : 2-4 weeks
- Peak age : 2-4 months
  (which coincides with peak age for SIDS)
- Constipation
  - – usual presenting symptom in infant botulism
  - – may precede motor symptoms by days or wks
- Most eventually have symptom of
  - – poor suck

Management of Botulism

Muscle weakness or flaccid paralysis

- ***Ventilatory*** support promptly
  - – Respiratory muscle weakness progresses rapidly
  - – Gag reflex frequently impaired (aspiration)
- Antitoxin: dramatic improvement
  - – Administered within the first 24 hours
- Antibiotics can clear the GI infections in infant botulism but contraindicated because
  - – Antibiotics increase toxin release; worsens condition
    - especially aminoglycosides, such as gentamicin or tobramycin
      - – potentiate N-M blockade

Lupus – A Rare Cause of Respiratory Insufficiency

Systemic lupus erythematosus (SLE)

- May mimic myasthenia (MG)
- Autoimmune disorder affecting many organ systems
- Central and peripheral nervous systems and muscles
- Neurologic deficits : result from local vasculitis
- Sensory loss to pain and temperature
  - sparing position sense (posterior column function)
    - suggests anterior spinal artery vasculitis-injury
- Prehospital, consider:
  Dexamethasone 10mg IV for ICP

Chronic Neurologic Disorders Causing Respiratory Insufficiency

- ALS (Lou Gehrig's Disease)
- Multiple Sclerosis
- Myasthenia Gravis

ALS (Lou Gehrig's disease)

- Amyotrophic lateral sclerosis (ALS) unknown cause
- Slowly progressive degeneration
  - Both upper and lower motor neurons
- Eventually fatal because of respiratory muscle weakness
- Aspiration pneumonia contributes to morbidity

ALS - a Death Sentence

- Diagnosis of amyotrophic lateral sclerosis
  - commonly known as ALS
  - a sentencing to disability and death
- Morrie Schwartz of *"Tuesdays with Morrie"*
- David Niven
- Jim "Catfish" Hunter
- Lou Gehrig
- Bob Waters WCU football coach
  - In coach Waters' case, some suspicion that chemicals on the San Francisco 49ers football field, where he and 3 other ALS patients were all former SF players played during '60s

Waters WCU football coach from 1969-1988

- Coached at WCU from 1969-1988.
- Resigned in March 1989 (died 3 months later)
- 1983 team was our school's best ever
  - Reached NCAA I-AA championship game
  - This information and more at the Waters tribute website:
    - http://catamountsports.collegesports.com/genrel/011205aab.html

Myasthenia Gravis (MG)

Rare autoimmune disorder

- Antibodies against
  - Acetylcholine (ACh) receptors at neuromuscular junction

Clinical presentation

- Body is limp
- Face may be expressionless
- Unable to support own head
- Jaw is slack when head id lifted
- Gag often absent
  - at risk for respiratory failure and aspiration

Respiratory Distress of MG

- Primary concern (in severe exacerbations of MG)
  - Adequate ventilation
  - Avoid both depolarizing or non depolarizing agents
- Prehospital treatment
  - Dexamethasone 10mg IV , or
  - Methylprednisolone (Solumedrol) 250 mg IV

Multiple Sclerosis (MS)

- Inflammatory demyelinating disease of entire CNS
- Spotty, involving different areas
- Age: 30 +/-
- Etiology (no known etiologic agent)
  - activation of T and B cells
    - pro-inflammatory substance high levels
    - interferon counteract pro-inflammatory substance
  - increased risk living in colder climates
  - family history
  - MRI can confirm diagnosis of MS
    - has improved dramatically the Dx and early Tx

Clinical Presentation of MS

- Visual
  - First symptoms usually: changes in vision
  - Blurred or hazy vision
  - Flashing lights
  - Alterations in color
- Nystagmus
- Bilateral trigeminal (CN V) weakness
  - Strongly suggests diagnosis of MS

Cerebellar and Motor Presentations of MS

- Balance and fine motor coordination
  - unexplained dropping of a cup
- Urinary retention
- Painful limb syndromes
  - weakness or numbness, as these symptoms are obscured by incapacitating fatigue
- Symptoms worsen with increased temperature
  - fever
  - eating a warm meal
  - taking a hot shower
  - strenuous exercise

Complications of MS

- Mortality from complications rather than of MS itself
  - Recurrent infections
  - Depression
- Avg life expectancy
  - 7 yrs shorter than that of general population
- Acute exacerbations
  - No effective treatment
  - Most widely used treatment:
    - Methylprednisolone ***1000*** mg IV daily (3-5 days)

Emergent Treatment in Acute and Chronic Neurologic Disorders

- Ventilation, Ventilation, Ventilation
  - ALS, MS, MG, GBS, SLE, Botox, tumor
- Dexamethasone 10mg IV for ICP
  - Spinal cord tumors
  - Herniation (tumor, thrombosis, abscess)
  - Lupus
- Methylprednisolone 250 – 1000 mg IV
  - MG
  - MS
- Plasmapheresis
  - GB