

High Altitude Disorders

- General
 - normally at high altitude you hyperventilate to increase oxygen in blood but some people don't hyperventilate and as a result get sick b/c poor hypoxia vasodilates causing pulmonary/cerebral edema, to prevent give Diamox which decreases bicarbonate which then stimulates hyperventilation lowering CO₂ and higher O₂
- **Sleep Disturbances (50%)**
 - Mechanism: not understood
 - S/S: poor sleep quality w/ frequent arousals and cognitive impairment during daytime
 - Tx: rest, gradual ascent, analgesics, oxygen, albuterol
- **Acute Mountain Sickness (30%)**
 - Mechanism: not understood
 - S/S: same + HA, decrease appetite, N/V, weakness/malaise (occurs 4hrs-1.5d after ascent and resolves after 2-5d)
 - Tx: same + 1° Acetazolamide 2° Dexamethasone
- **High Altitude Pulmonary Edema (HAPE) (0.01%)**
 - Mechanism: not understood
 - S/S: same + SOB and dry cough that can progress to pinky frothy productive cough, F, AMS that can progress to death
 - CXR: linear opacities progressing to patchy air space disease and more confluent disease in the mid/lower lung fields
 - Tx: same + nifedipine and descend to lower altitude

Sleep Disorders

- General
 - REM (25%) interspersed throughout Non-REM (highest amounts toward morning) active brain in a quite body, unstable VS
 - Non-REM (75%) four stages (1-4) which occur in cycles, VSS
 - Stage 1: transition zone from wake to sleep and vice versa
 - Stage 2: high voltage K complexes and high frequency sleep spindles
 - Stage 3/4: "deep sleep" with slow high voltage waves
 - REM: low voltage saw tooth pattern waves
 - Repeat and as the night progresses there is more REM and less Stage 3/4 sleep
 - It is a combination of circadian rhythm based on Zeitgebers (stimuli that synchronize wake/sleep, light/dark is the most important one) and homeostasis (where the body knows if you are undersleeping or oversleeping and wants to compensate)
- **Insomnias (refer)**
 - Secondary: shift work, jet lag, meds (caffeine, nicotine, alcohol), diseases (CHF, COPD, asthma, GERD, hyperTH, chronic pain, psych)
 - Primary:
 - Tx:
 - sleep hygiene (wake up each time each day, stop meds above 6hrs before sleep, avoid heavy meals but consider a small meal before sleep, regular exercise but not before sleep, minimize light/noise/temp, avoid clock watching, use bed only for sex/sleep, etc)
 - meds (melatonin, psuedomelatonin like ramelteon, benzos, nonbenzo GABA agonists like zolpidem/zaleplon/eszopiclone, antidopaminergics, antihistamines, serotonin, adenosine (blockers are theophylline and caffeine))
- **Parasomnias (refer)**
 - **Parvus Nocturnes (Night Terrors)**
 - **Somnambulism (Sleep Walking)**
 - **Nightmares**
 - **REM Behavior Disorder (RBD)**
 - **Narcolepsy**
 - Tetrad: sleepiness + cataplexy (abrupt reversible loss of muscle tone elicited by strong emotion, stress, etc) + hypnagogic hallucinations + sleep paralysis (pt find themselves unable to move, speak, or breathe deeply at onset/offset of sleep)
 - Very common in Japan w/ HLA-DR1510/DQB1-0602
 - Defect in hypocretin aka orexin in hypothalamus
 - Mechanism: REM sleep intruding into wake states
 - Tx: sleep hygiene, safety issues, meds (Adderall, Provigil, etc)
 - **Restless Leg Syndrome (RLS)**
 - Mechanism: very unclear but what is known is that there is impairment of dopamine transport in the substantia nigra due to reduced intracellular iron (ferritin)
 - Criteria
 - 4/4 Major
 - Urge to move leg aka akathisia (1 calf 2 thigh 3 foot, usually flexion hip and knee, usually bilateral) w/ or w/o paresthesia (tingling, itching, "creeping-crawling" etc)
 - Sx worsen during inactivity
 - Sx improve with activity

- Sx worsen at night
 - Other: Sleep Disturbance, Normal Neuro Exam, +FHx, Dopamine Response, Chronic Progressive Course, During the day pt moves legs when inactive, ADHD as a child, RFs: RF, pregnancy, et al
- Treatment
 - Dopamine Agonists: ropinirole (Requip)
 - Neuropathic Pain Agents: gabapentin (Neurontin), pregabalin (Lyrica)
 - Benzodiazepines
 - Opiates
- NB Periodic Limb Movements of Sleep (PLMS) rhythmical extensions of the big toe and dorsiflexions of the ankle with occasional flexions of the knee and hip that usually occur during night
- **Sleep Disordered Breathing (SDB)**
 - Ranges from nl to intermittent snoring to chronic snoring to Upper Airway Resistance Syndrome (UARS) to OSA
 - Snoring is a nuisance but is without significant health sequelae unless chronic vs Pickwickian which has very high M/M
 - ½ men vs ¼ women snore but only 4% men vs 2% women have OSA
 - Def: intermittent cessation of airflow by >30%(apnea)/>70%(hypopnea) for >10sec accompanied by a decrease in SaO₂ by ≥4% during sleep
 - UARS increased respiratory effort with frequent arousals but no overt apneas
 - S/S: apnea arouses pt from sleep pt then falls back to sleep (up to 400-500 cycles/night)
 - Staging: Apnea Hypopnea Index (AHI) = # of A or H / hrs of sleep where 5-15 (mild), 15-30 (moderate), >30 (severe)
 - Two Types:
 - **Central (CSA) during the reduction in airflow there is NO respiratory effort**
 - Mechanism: neural drive for respiration is temporarily abolished b/c the PCO₂ threshold changes
 - RFs: obesity (Pickwickian or Obesity Hypoventilation Syndrome), CHF, liver failure, renal failure, CNS disorders, ascent to high altitude
 - S/S: similar to OSA
 - Tx: treat underlying problem then consider CPAP
 - **Obstructive (OSA) during the reduction in airflow there is respiratory effort**
 - Mechanism: negative intraluminal pressure that is generated during inspiration exceeds ability of airway dilators to maintain airways patency (while pt is awake these muscles are much more active hence only during sleep)
 - RFs: age, male (androgens induce neck fat deposition), obese esp w/ large neck >17cm (easier to collapse airway), sedatives for sleep, hypoTH (causing macroglossia, obesity, reduced resp drive), macroglossia, retro-/micro-gnathia, acromegaly, adenoidal/tonsillar hypertrophy, nasal congestion, EtOH (decreases activity of muscles), smoking, craniofacial abnormalities, +FHx, vocal cord paralysis
 - S/S: excessive daytime sleepiness, morning headaches, partner witnesses snoring/apnea, pt awakens w/ sense of gasping/choking, nocturnal diaphoresis, intellectual deterioration, personality changes
 - DDx: inadequate sleep, poor sleep hygiene, chronic pain, shift work, meds, drugs, depression, other sleep disorders
 - Complications
 - CNS: CVA
 - CV: CAD, Afib, S/P HTN w/ Cor Pulmonale
 - Endo: Metabolic Syndrome
 - Other: driving and work related accidents and impaired intellectual fxn
 - Dx: thorough oro/nasopharyngeal exam, Nocturnal Polysomnography aka "Sleep Study" (electroencephalography-EEG, Electrooculography-EOG, Electromyography-EMG, O2Sat, VS, PFTs, limb movements) NB important to know that studies indicate that H&P is neither sufficiently sensitive nor specific for the Dx of OSA hence Polysomnography is necessary
 - Tx:
 - 1st: weight reduction, decrease alcohol use, smoking cessation, don't sleep supine, exercise, avoid muscle relaxants or alcohol or sleeping pills, improved sleep hygiene, nasal decongestants, oral appliances which reposition tongue/mandible anteriorly, do not engage in potentially dangerous activities during the day, modafinil (Provigil), if clearly position dependent specifically occurring when sleeping supine some recommend slipping a tennis ball behind the back of a shirt to prevent pt from rolling on their back, nasal steroids are good for snoring
 - 2nd: Nasal or Oronasal Continuous Positive Airway Pressure (CPAP) (usually 8-10mmHg) acting as a pneumatic splint holding nasopharyngeal airways open (if pt fails this then try BiPAP before considering surgery)
 - Indication for CPAP: AHI >15 of AHI 5-10 AND HTN/Stroke/Sleepiness/CAD/Insomnia/Psych issues
 - Now there are auto-titrating machines which titrate pressure based on airflow cessation

- Compliance is the biggest problem (only 50% compliant)
- You CANNOT just use nocturnal oxygen
- 3rd: surgically increase in dimension of retropalatal airspace (Uvulopalatopharyngoplasty) retrolingual airspace (Genioglossal/Mandibular Advancement) or both (Maxillomandibular Advancement) NB only really effective if pt has definitive anatomic abnormalities otherwise not very effective at all
- 4th: Tracheostomy



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