

Obstructive Sleep Apnea

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<http://www.geocities.com/jonesapjr/index.html>

Learning Objective

^ Describe the etiologies, manifestations, complications, diagnosis and management for obstructive sleep apnea.

Epidemiology

Definitions

- ^ Obstructive sleep apnea (OSA)- cessation of airflow with persistent respiratory effort.
 - ◆ partial or complete airway collapse during sleep
 - ◆ reduced airflow
 - ◆ impaired gas exchange
 - ◆ recurrent arousals from sleep

Definitions

- ^ Central apnea is the cessation of airflow with no respiratory effort.
- ^ Mixed apnea- begins as central apnea and ends as obstructive apnea.

Definitions

- ^ Apnea- cessation of airflow for 10 sec.
- ^ Hypopnea- airflow reduced by 50% for 10 Sec. or by 30% with desaturation
- ^ Apnea hypopnea index (AHI)- measure of apneic events/hour

Prevalence

- △ Diagnosis of OSA is relatively new
- △ Adult men- 3-7%
- △ Adult women- 2-5%

Significance

- △ Patients with OSA use healthcare resources at increased rates, even before formal diagnosis.
- △ Early recognition and treatment may prevent complications that result from OSA.

Risk Factors

- △ Age >65 (65% incidence?)
- △ Excess body weight
 - ◆ 60% of tested patients are overweight
 - ◆ 10 kg increase ==> likely increase in apnea-hypopnea events by > 15/hr
- △ Gender- male > female

Risk Factors

- △ Race- African-American > white
- △ Shift workers
- △ Craniofacial abnormalities
 - ◆ brachycephaly- wide head
 - ◆ micrognathia- small mandible
 - ◆ macroglossia- large tongue
- △ Large neck circumference

Risk Factors

- △ Nasal congestion
- △ Familial predisposition
- △ Current smoking- airway inflammation
- △ Secondhand smoke exposure
- △ Alcohol consumption
- △ Pregnancy (females)

Complications

- △ Cardiovascular disease- associated only with hypopneas with $\geq 4\%$ desaturation
- △ Systemic hypertension
- △ Pulmonary hypertension
- △ Atrial fibrillation
- △ Stroke

Complications

- ^ Sudden death
- ^ Increased risk for post-surgical complications
- ^ Daytime sleepiness
 - ◆ MVAs
 - ◆ work-related accidents

Complications

- ^ Sudden death
- ^ Increased risk for post-surgical complications
- ^ Daytime sleepiness
 - ◆ MVAs
 - ◆ work-related accidents
- ^ Impaired cognitive function
- ^ Decreased health-related quality of life (HRQL)

Complications

- ^ Metabolic complications
 - ◆ insulin resistance
 - ◆ oxidative stress
 - ◆ pro-inflammatory stress
 - ◆ impaired vasodilator response-impairs treatment for hypertension

Link to eMedicine article on sleep apnea
<http://www.emedicine.com/med/TOPIC2697.HTM#Multimediamedia4>

Pathophysiology

Normal Sleep Patterns

- ^ Sleep cycles
 - ◆ 4-5 cycles/night
 - ◆ 90-110 min/cycle
 - ◆ five stages each cycle
 - ◆ alternate between REM and non-REM sleep

Normal Sleep Patterns

- ^ Non REM Stages
 - ◆ stage one- dozing
 - ◆ stage two- light sleep
 - ◆ stage three- deep sleep (slow wave)
 - ◆ stage four- deeper sleep (slow wave)

Non-rapid eye movement (NREM) sleep

- ^ Absence of dreaming
- ^ Slow (delta) EEG waves
- ^ Reduced sympathetic tone ==> reduced HR, BP
- ^ Deep sleep- regular, slow breathing
- ^ PaCO2 increases 5 torr
- ^ PaO2 decreases 5 torr

Link to article on sleep patterns
<http://www.talkaboutslepp.com/sleep-disorders/archives/intro.htm>

REM Sleep

- ^ dreaming
- ^ increased HR, RR
- ^ muscular paralysis
- ^ first REM stage- 10 minutes
- ^ longer duration for subsequent cycles, up to 90 minutes REM

REM Sleep

- ^ dreaming
- ^ increased HR, RR
- ^ muscular paralysis
- ^ first REM stage- 10 minutes
- ^ longer duration for subsequent cycles, up to 90 minutes REM
- ^ decreased airway tone- permits obstruction
- ^ decreased response to hypercapnia, hypoxemia

Obstructive apnea

- ^ During REM sleep
- ^ Inactive genioglossus muscle enables soft palate & uvula to impose on posterior pharynx

Click to view image of genioglossus muscle
http://www.innerbody.com/image_dige01/dige31-new.html

Obstructive apnea

- ^ During REM sleep
- ^ Inactive genioglossus muscle enables soft palate & uvula to impose on posterior pharynx ==>
 - ◆ obstruction
 - ◆ snoring
 - ◆ hypopnea/apnea event
 - ◆ desaturation
 - ◆ arousal from sleep

Click for brief video on OSA
http://video.google.ca/videoplay?docid=-4943378980039385073&q=sleep+apnea&ei=7V0SMX9A5Se_AHr4dCBcw&hl=en

Manifestations

Sleep apnea

^Types

- ◆Central
 - fabsence of ventilatory effort
 - fabsence of flow
- ◆Obstructive- airway closure
 - fpresence of effort
 - fabsence of flow
- ◆Mixed- central apnea/obstructive apnea

Symptoms

- ^snoring- disrupted snoring 70% predictive sensitivity
- ^witnessed apnea- 90% predictive sensitivity
- ^sleep complaints
 - ◆insomnia
 - ◆disrupted sleep
 - ◆daytime somnolence

Symptoms

- ^cognitive deficits
- ^sexual dysfunction
- ^gastroesophageal reflux (GERD)

Signs

- ^Obesity
- ^Large neck circumference
 - ◆male.....≥ 17 in.
 - ◆female.....≥ 15 in.
- ^Airway abnormalities
 - ◆severe nasal obstruction
 - ◆low-hanging soft palate
 - ◆large (hypertrophied) uvula
 - ◆enlarged tonsils and/or adenoids
 - ◆macroglossia

Manifestations- severe OSA

- ^Formerly, Pickwickian syndrome
- ^Middle-aged, fat, snoring male
- ^Daytime somnolence
- ^Systemic hypertension
- ^Pulmonary hypertension
- ^Cor pulmonale
- ^Cyanosis
- ^Polycythemia

Click to see Dickens' John
<http://biomed.uninet.edu/2006/n1/rabec/graf1.jpg>

Diagnosis

Screening Questionnaires

- ^ Various questionnaires for practitioners
- ^ Screening for anesthesia
 - ◆ STOP scale
 - ◆ Berlin questionnaire

Link to an OSA screening questionnaire
http://www.sleephealth.com/professionals/screening_tool.htm

Polysomnography

- ^ Gold standard for sleep disorders
- ^ Electroencephalogram (EEG)- brain activity
- ^ Electro-oculogram (EOG) - eye motion
- ^ Electromyogram (EMG)- muscular activity

Link to polysomnography testing- sensors, etc.
<http://classes.kumc.edu/cahe/respcared/cybercas/sleepapnea/trenpoly.html>

Polysomnography

- ^ Electroencephalogram (EEG)- brain activity
- ^ Electro-oculogram (EOG) - eye motion
- ^ Electromyogram (EMG)- muscular activity
- ^ Respiratory inductive plethysmography (RIP)- thoracic and abdominal motion
- ^ ECG
- ^ Nasal airflow sensor
- ^ Pulse oximetry

Link to a picture of a sleep center
<http://www.wesleymc.com/CustomPage.asp?PageName=SleepDisordersCenter>

Unattended PSG

- ^ Apnea risk evaluation system (ARES)
 - ◆ wireless- worn on forehead
 - ◆ oxygen saturation (SpO2)
 - ◆ pulse rate
 - ◆ airflow
 - ◆ respiratory effort
 - ◆ venous volume
 - ◆ snoring levels
 - ◆ head movement and position

Link to ARES
<http://www.b-alert.com/ARES.html>

Unattended PSG

- ^ Lifeshirt system
 - ◆ Adult and pediatric monitoring
 - ◆ Analyzes breathing patterns
 - ◆ Incorporates RIP technology
 - ◆ Distinguishes obstructive sleep apnea from central sleep apnea
 - ◆ Validated by research

Click to view the Lifeshirt (™)
<http://www.vivometrics.com/sleep/index.php>

Unattended PSG

- ^ less cost
- ^ comparable results (research)
- ^ approved by Medicare, insurers
- ^ greater validity- less first-night effect
- ^ not recommended for:
 - ◆ patients with comorbidities
 - ◆ screening asymptomatic patients

Obstructive apnea

- ^ Cutoffs for levels vary among sleep centers
- ^ Recommendations for levels of apnea-hypopnea indices (AHIs):
 - ◆ Mild.....5-15/hr
 - ◆ Moderate.....15-30/hr
 - ◆ Severe.....>30/hr

Management

Management- central apnea

- ^ O2 therap
- ^ CO2- respiratory stimulation
- ^ NIPPV- with backup rate
- ^ Respiratory stimulants
 - ◆ acetazolamide (Diamox)
 - ◆ theophylline

Link to article on treatment of central sleep apnea
<http://www.chestjournal.org/cgi/content/abstract/131/2/595>

Management- obstructive & mixed

- ^ Weight loss- sometimes, cures OSA
- ^ Medications- rarely prescribed
- ^ Oral appliance- mandibular advancement splints
 - ◆ may be available from dentists
 - ◆ custom made
 - ◆ "boil & bite"

Link to mandibular advancement splints
<http://www.mandibularadvancementsplint.com/>

Management- obstructive & mixed

- ^ Tracheotomy- bypass obstruction
- ^ Reconstructive surgery:
 - ◆ maxillomandibular advancement- most effective surgical intervention
 - ◆ uvulopalatopharyngoplasty (UPPP)
 - ◆ pharyngeal flap
 - ◆ tonsillectomy- cure for some patients

Click for description and images of surgical interventions
<http://www.sleepapneasurgery.com/pharyngoplasty.html>

Management- obstructive & mixed

- ^ Continuous positive airway pressure (CPAP)
- ^ BiPAP
- ^ Guidelines for selection and titration cited in references: Kushida et al. 2008.

Management- obstructive & mixed

- ▲ APAP- automatic positive airway pressure
 - ◆ automatically adjusts pressure to ensure ventilation.
 - ◆ may replace some sleep studies

Link to Respironics BiPAP AVAPS (™)
<http://bipapavaps.respironics.com/>
 Link to Resmed Autoset (™)
<http://www.resmed.com/en-us/>

Patient interfaces

- ▲ Nasal mask
- ▲ Full face mask
- ▲ Nasal pillows

Link to videos about CPAP & BiPAP equipment
<http://www.cpap.com/listVideos.php?VGID=ALL>

CPAP & BiPAP Compliance

- ▲ OSA severity :: CPAP compliance
- ▲ About 50% OSA patients comply with prescriptions
- ▲ Barriers to compliance
 - ◆ discomfort with interface
 - ◆ claustrophobia
 - ◆ nasal congestion

CPAP & BiPAP Compliance

- ▲ Strategies to improve compliance
 - ◆ patient/family education
 - ◆ appropriate type and level of treatment
 - ◆ most comfortable interface
 - ◆ humidification- preferred by some patients
 - ◆ automatic devices- preferred by some
 - ◆ follow-up- esp. by physicians

Link to article on improving compliance
http://www.rtmagazine.com/issues/articles/2007-06_04.asp

Didgeridoo Playing for OSA

- ▲ Serendipitous discovery- players with OSA noticed reduced symptoms.
- ▲ Randomized trial found decreased:
 - ◆ AHI
 - ◆ snoring
 - ◆ daytime sleepiness

Click to download article on didgeridoo and OSA
<http://www.bmj.com/cgi/content/full/332/7536/266>

Didgeridoo Playing for OSA

- ▲ Disadvantages
 - ◆ practicality?
 - ◆ neighbors?
- ▲ Implication- exercises that mimic didgeridoo playing may be effective.

Link to video of didgeridoo playing
<http://www.youtube.com/watch?v=9g592l-p-dc>

Link to the didgeridoo store
http://www.didgeridoostore.com/didgeridoo_sleepapnea_snoring.htm

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