Sleep Apnea and the Eye

Course Title: Sleep Apnea and the Eye
Lecturer: Brad Sutton, OD, FAAO
IU School of Optometry
Clinical Professor

Types of Sleep Apnea

- Central Sleep Apnea (.4%)
- Obstructive Sleep Apnea (OSA), 84%
- Mixed (15%)

- Apnea is Greek word meaning “without breath”
- Needs to be part of history

Central Sleep Apnea

- Break in respiratory effort
- Improper central command
- Uncommon
- Known as Cheyne-Stokes syndrome

Obstructive Sleep Apnea

- Soft tissues of the throat collapse and occlude airway
- Happens continually during sleep cycle
- Occlusion of airway leads to decreased blood oxygen
- Brain then signals body to “wake up” and breathe

OSA

- Most common in overweight / obese men
- Gasping episodes
- Snoring very common
- Symptoms of daytime sleepiness
- Cognition problems
- Restless sleep, morning headaches

No financial disclosures
“Pickwickian Syndrome”

- Comes from the “fat boy” character in Charles Dickens novel “The Pickwick Papers”
- Refers to the character traits and general habitus of OSA patients

OSA

- Each pause in breathing is an “apnea”. Last seconds to minutes
- Each low breathing event is called a hypopnea
- Risk factors include obesity, age, male, smoking, neck circumference over 48 cm (19 inches)

Risks and signs

- Snoring
- Tiredness
- Observed stop in breathing
- Pressure (increased BP)

- BMI
- Age (>50)
- Neck Size (19 inches)
- Gender (Male)

OSA

- Very, very sensitive sign

- Snoring that stops
- Sleeping partners aware
- Sufferer almost never aware during sleep, but experiences associated problems during the day

OSA systemic complications

- Heart disease
- Hypertension (due to increased epinephrine and norepinephrine production)
- HTN induced by sleep apnea does not decrease with sleep
- Stroke and atrial fibrillation

- Interestingly, OSA patients who have a non-fatal heart attack often have less residual damage.
- Perhaps their tissue is more used to ischemia from chronic poor oxygen delivery.
OSA statistics

- Incidence varies widely in the literature
- High end of up to 24% of M and 9% of F
- 80% of men and 90% of women with OSA are undiagnosed
- Untreated OSA patients have yearly medical costs $1336 greater on average than those without OSA

- Only 10% of people with OSA are actually treated
- 70% of obese individuals have OSA
- 50% of heart disease patients have OSA
- 60% of stroke patients have OSA

- 80% of patients with difficult to control hypertension have OSA
- African Americans at 2.5 X risk
- High incidence in psychiatric populations
- And most importantly........34% of NFL lineman have OSA!

Cancer and OSA

- April 2014 issue of the Journal of Clinical Sleep Medicine
- Patients with OSA followed for 20 years had, compared to normals............
  - Cancer incidence was 2.5 X higher with OSA
  - Cancer mortality was 3.4 X higher

Diagnosis of OSA

- Epworth sleepiness scale
  - Uses self report of likelihood of falling asleep during separate activities
  - Scored on a scale up to 24 points

  - 0 = unlikely
  - 1 = slight
  - 2 = moderate
  - 3 = high

- Pulse oximetry
  - Performed at home
  - Measures blood oxygen levels at various times during the night
  - Low blood oxygen is called hypoxemia
Diagnosis of OSA

- Gold standard is Polysomnography sleep study
- Inconvenient and problematic for many patients because they must stay overnight
- “Hooked up” to a large number of machines
  - EEG for brain waves
  - EOG for eye movements
  - EMG for muscle activity
  - Measurement of oral and nasal air flow
  - Measurement of chest / abdominal movement
  - Audio snoring recording
  - Oximetry and video

Sleep study order IU Health

- Prices at different facilities range from $3000.00 to $5000.00!!!!!!!

Diagnosis of OSA

- AHI = Apnea Hypopnea Index
- RDI = Respiratory Disturbance Index
- Less common tests include sleep latency and maintenance of wakefullness tests

- 5-15 events per hour = mild OSA
- 15-30 = Moderate OSA
- > 30 = Severe OSA
- Home testing devices starting to gain favor. Driven by insurance carriers due to cost of PSG. About $800

Treatment options for OSA

- Lose weight!
- Stop smoking
- Avoid alcohol
- Avoid sleeping pills
- Sleep on side
- Acetazolamide (lowers blood PH and encourages respiration)

- Dental appliances (OAT)
- Move lower jaw forward to keep airway open
- MakeS TMJ worse!

- 75% effective in mild and moderate OSA

Treatment options for OSA

- Pillar procedure
- Performed in office with anesthetic and syringe
- Inserts Dacron strips on to soft palate to keep airway open

- CPAP
- Continuous Positive Airway Pressure
- A machine and mask combine to provide a continuous flow of air to “force” airway open

- Amount is titrated, but continuous
Treatment options for OSA

- Many different manufacturers of “machines” and “masks”
- Masks can be nasal or more full face
- Less than 50% of people stick with therapy
- Uncomfortable
- Noisy
- Difficult when traveling
- No “point of use” satisfaction

When CPAP does not work

- Auto titrating CPAP
- Continually adjusts flow pressure automatically
- BIPAP
- Delivers higher dosing, and has a different pressure between inhaling and exhaling
- For both, usually must try CPAP first (insurance)

Surgical options for OSA

- Maxillo-Mandibular Advancement (MMA)
- Uvulopalatopharyngoplasty (UPPP)
- Tongue reduction surgery (seriously!)

Some new options........

- 1) Provent: band-aid like device covering each nostril with center valve creating pressure. $70 per one month supply
- 2) Winx: Small mouthpiece that rests inside the mouth and creates suction to open airway. $700
- 3) Inspire upper airway stimulation: stimulates nerves to keep airway open. Not yet FDA approved.

Alternative treatment for OSA

- Playing the didgeridoo!
- Strengthens muscles in the throat thus preventing night time collapse
- Proven effective in a 2005 study in the British Journal of Medicine

Ocular Side effects of OSA

- Floppy Eyelid Syndrome (FES)
- Keratoconus
- NAION
- Glaucoma, especially NTG
- Papilledema
- ICSC
- CPAP side effects
CPAP side effects

- Dry eye and irritation secondary to air leakage around mask or nose to eye
- Increased incidence of bacterial conjunctivitis: probably related to above
- Increased IOP during use: up to 5-8 points: ? If on glaucoma therapy

Floppy Eyelid Syndrome

- First described in 1981 by Culberston and Ostler
- Less than 5% of people with OSA have FES.............but essentially 100% of people with FES have OSA

Floppy Eyelid Syndrome

- Lash ptosis very common
- Typically improves with control of OSA
- Relationship unclear, but may be due to increased MMP leading to decreased elasticity of tissue

UNDERDIAGNOSED!

FES

- Most commonly overweight men
- Eyelids are very loose and rubbery
- Evert easily with minimal pressure
- Associated with keratoconus: Rubbing vs. elastic issue

FES

- Problem comes when lids contact the pillow during sleep and evert or open

Lash ptosis
Lash ptosis

Symptoms of F.E.S.

- Dry, gritty, irritated eye or eyes upon awakening that get better as the day goes on
- If patient always sleeps on one side, only that eye is affected
- Punctate Keratitis
- Conjunctivitis
- Mucous discharge
- Can then get Mucous Fishing Syndrome

Treatment of F.E.S.

- Patient education
- Weight loss and management of OSA
- Night time lubricating ointment
- Sleep with cylinder pillow (“dog bone” pillow)
- Use firm sleep mask
- Taping of lids (no one complies with this!)
- Surgical resection of tissue

New Study Regarding FES and Glaucoma

- Journal of Glaucoma 2014: 23; (1)
  1) 75 patients with OSA but no FES
  2) 52 patients with OSA and FES
  3) 25 patients without OSA
- % of patients with glaucoma of any type......
  1) 5%
  2) 23%
  3) 0%

Papilledema

- Some patients with OSA have increased ICP at night
- Lumbar tap opening pressure tends to be normal during waking hours
- Can lead to papilledema if severe enough
- Association unclear
- Perhaps just having obesity as a common risk factor
- But if so, why is ICP up only at night?
- Also, treatment with CPAP decreases ICP
- Consider especially in males with IIH
I.C.S.C. (Central Serous)

- Recently linked in some patients to OSA
- Unknown cause, perhaps related to increased epinephrine causing increased catecholamine levels
- Keep possible link in mind

Glaucoma

- OAG and NTG are both more common in patients with OSA
- Prevalence in various studies is highly variable
- Highest in literature are 27% of OSA patients in one study with OAG, 43% in another with NTG

- Most are much lower, but still well above the rate in the general population

Glaucoma

- Believed to be related to poor blood flow and decreased oxygen delivery to the optic nerve
- Especially important to consider with NTG
- Worth looking into OSA with NTG patients who have symptoms

- Especially common in NTG patients who progress despite very low IOP
- Remember that CPAP therapy can raise IOP!

NTG

- Could OSA possibly explain Drance Hemorrhages?
- How about the propensity for paracentral VF defects?

NAION

- Very highly associated with OSA
- In one study of NAION patients, 12 / 17 had OSA while 3 / 17 controls did
- In another, 24 / 27 had OSA

- Most often, vision loss is noted upon awakening
- Believed to be a hypoperfusion event leading to poor blood perfusion of optic nerve
- Typically encountered in “disc at risk” patients

Nonarteritic ION

- Swollen, hyperemic nerve with splinter hemorrhages and exudates
- Often sectoral
- NAION has 5x risk of sleep apnea, 8x risk in women compared to the general population
Nonarteritic ION

- Often APD, color vision usually normal
- Most frequent visual field defect is inferior nasal/partial altitudinal but may get essentially any type. FDT may be more sensitive and often shows spillover of loss in to "non-affected" hemifield
- After swelling resolves the nerve is pale but often not cupped-cupping may occur, however
- Why does area of swelling not always match VF defect?

NAION 2 weeks after initial symptoms

NAION

- VA varies widely from normal to severe loss: 45% 20/40 or better but 33% 20/200 or worse
- VA loss progresses over 2-4 weeks
- VA improves by up to three lines at six months in 40%
- In patients under 50 years of age, there is a higher rate of bilateral involvement and more visual recovery

NAION

- No systemic symptoms of GCA; normal ESR/CRP
- Most common cause of ONH swelling over the age of 55 (2-10 cases per 100,000 per year)
- 45-60 year olds (any age possible) with no sex predilection; C > AA

Nonarteritic Etiologies

- 1) Sleep apnea Up to 90%
- 2) Hypertension (40%) (med related?)
- 3) Idiopathic (27%)
- 4) Diabetes (17%)
- 5) Atherosclerosis (14%)
- 6) Migraine (12%)
- 7) Increased Homocysteine / Decreased vitamin B6
Nonarteritic ION

- Approximately 15% of cases will involve the fellow eye in 5 years. Repeat attacks in same eye < 5%

- No consistently proven treatment. Can consider oral steroids when VA 20/70 or worse, but controversial
- Can consider aspirin to help prevent fellow eye attack. Also controversial

Case example

- NAION OD leads to diagnosis of OSA after sleep studies are performed
- Patient was prescribed CPAP but did not comply with use
- Following pictures illustrate course of events

NAION OD: The Beginning

Optic atrophy / incipient ION

Optic atrophy OU
Post op (complete hysterectomy)
NAION

OD       OS

Incipient ION

• We see it coming, but can we do anything about it?
• Will it always end badly?
• Final thought: Diabetic patients with OSA have 50% greater risk of severe retinopathy