Sleep Apnea and Sleep Hygiene

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Clinical Questions

- Is bariatric surgery an effective therapy for OSA?
- Are any medications proven to be effective for OSA?
- What therapy is most effective for most patients with OSA?
- Are oral appliances effective for OSA?
- What is the relationship between atrial fib and OSA?
- Should children with OSA expect long-lasting symptom relief from T&A?
- What are the best solutions to chronic insomnia?
Obstructive Sleep Apnea
A Short Literature Review

First References to Sleep Problems in the National Library of Medicine PubMed

• Peltier LF. Obstructive apnea in artificially hyperventilated subjects during sleep.
  — J Appl Physiol. 1953 Apr;5(10):614-8

• Sinisi C. [On the pickwick syndrome and its disturbances of a narcoleptic type].
  — Rass Neuropsichiatr. 1963;17:554-76 Italian

• De Padua F. [Respiratory insufficiency and circulation].
Contemporary Research on Sleep Apnea

- 24,271 PubMed references as of Jan 2012
  - 1,745 clinical trials
  - 84 clinical practice guidelines
- We will review 16 mini-abstracts only!
- Bottom lines of research on sleep apnea
  - Treatment improves symptoms in many patients
  - Surgery is effective in relieving symptoms in some patients
  - There are few randomized trials proving value of treatments for improving cardiovascular outcomes despite the proven associations with adverse outcomes
  - There is significant under-diagnosis

Obstructive Sleep Apnea Definitions

- Polysomnography (PSG) reveals > 5 obstructive events/hr and at least one of the following
  - Daytime sleepiness, sleep attacks, unrefreshing sleep, fatigue or insomnia
  - Waking with breath holding, gasping or choking
  - Observer reports loud snoring, breathing interruptions or both

OR

- PSG reveals > 15 obstructive events/hr
OSA Risk Factors

- Sleep Heart Health Study
  - Male, age, BMI, neck girth, snoring and witnessed apnea predict AHI >15
- Risk in women increases with BMI and postmenopausal status
- Positive family history increases risk 2 - 4 fold
- Ethanol and sedative hypnotics
- Allergies
- Smoking

Associations with OSA

- Hypertension
- Coronary artery disease
- Congestive heart failure
- Atrial fibrillation
- Stroke
- Hyperlipidemia
- Increased glucose / insulin resistance → Obesity
- Cognitive impairment
- Daytime sleepiness
Expert Panel Guidelines, 2009

- Questions regarding OSA should be incorporated into routine health evaluations. Suspicion of OSA should trigger a comprehensive sleep evaluation.
- Work-up includes a sleep-oriented history and physical examination, objective testing, and education of the patient.
- The presence/absence and severity of OSA must be determined before initiating treatment to identify those at risk of developing complications of sleep apnea, guide appropriate treatment, and to provide a baseline.
- The patient should be included in deciding an appropriate treatment strategy that may include positive airway pressure devices, oral appliances, behavioral treatments, surgery, and/or adjunctive treatments.
- OSA should be approached as a chronic disease requiring long-term, multidisciplinary management. For each treatment option, appropriate outcome measures and long-term follow-up are described.

Some General Facts About Sleep Apnea

- Hormone levels, metabolism, mood, pain perception, memory, overall sense of well-being are profoundly affected by sleep.
- The frequent arousals result in ineffective sleep and account for the chronic sleep deprivation and the excessive daytime sleepiness that is a major hallmark of this condition.
- Additional effects include morning headaches, increase in blood pressure, heart-rhythm disorders, stroke, and decreased life expectancy.
- Because many of the factors contributing to OSA appear to have significant genetic influences (such as bony dimensions of upper airways), genetic risk factors are likely important in the occurrence of OSA.
- OSA also occurs in children and is generally related to enlarged tonsils or adenoids. It occurs equally often in boys and girls and is most common in preschool-age children.
Some General Facts About Sleep Problems

- Sleep loss has an impact on all facets of life and virtually all organ systems
  - Continuous electrocardiographic monitoring in 566 people undergoing polysomnography found that AF occurred in 5% of those with severe sleep apnea and only 1% of those without sleep apnea.
  - Untreated apnea doubles the risk of recurrent atrial fibrillation
  - Sleep disorders cause academic and behavior problems in kids
  - Sleep loss is associated with increased risk of obesity and diabetes
  - Drowsy driving is responsible for over $12 billion in reduced productivity/property loss per year

Sleep Apnea is under-diagnosed

- 24% of men & 9% of women have sleep apnea; 80-90% are undiagnosed

- Some contend that everyone with a metabolic/cardiac co-morbidity should be screened for sleep apnea
Under-Diagnosis of Sleep Apnea

• Methods
  – Information from 44 randomly selected practices in 5 regional practice-based research networks

• Results
  – > 90% of adult patients visiting a PCC on any given day are experiencing sleep-related symptoms. Based on their Berlin Questionnaire scores, > 1/3 are at high risk of having sleep apnea. Most patients have not discussed their sleep-related symptoms with their PCC, < 1/3 have sleep-related symptoms documented in their medical records

• Conclusions
  – Substantial proportion of patients who see PCCs regularly are at high risk for OSA. Very few of them are being diagnosed or treated

• Chai-Coetzer found that a two-stage model of screening questionnaire followed by home oximetry can accurately identify patients with OSA in primary care and has the potential to expedite care for patients with this common sleep disorder

Treatment Options

• Treatment for adult OSA can include behavioral therapy such as losing weight, changing sleeping positions, avoiding alcohol, tobacco and sleeping pills

• Positive pressure devices CPAP and biPAP

• Mechanical devices that reposition the lower jaw and tongue

• Surgery to increase the size of the airway
Drug Therapy For OSA In Adults

• Methods
  – Review of twenty-six trials of 21 drugs, involving 394 participants contributed data to the review. Most trials had flaws.

• Results
  – Six drugs had some impact on OSA severity and two altered daytime symptoms. No significant benefits were found for medroxy-progesterone, clonidine, mibefradil, cilazapril, buspirone, aminophylline, theophylline doxapram, ondansetron or sabeluzole.

• Conclusions
  – There is insufficient evidence to recommend the use of drug therapy in the treatment of OSA. For fluticasone, mirtazapine, physostigmine and nasal lubricants, studies of longer duration are required to establish whether these have an impact on daytime symptoms.

Oral Appliances For Obstructive Sleep Apnea

• Methods
  – Meta-analysis of randomised trials comparing oral appliances (OA) with control or other treatments in adults with OSA. Seventeen studies with 831 participants

• Results
  – Compared to controls, in 6 studies oral appliances reduced daytime sleepiness and improved apnoea-hypopnoea index (AHI) by -10.78 events/hr
  – Compared to CPAP there was no statistically significant difference in symptoms, although OAs were less effective than CPAP in reducing apnoea-hypopnoea index.
  – CPAP was more effective at improving arterial oxygen saturation during sleep compared with OA.
  – OA versus corrective upper airway surgery (one study): Daytime sleepiness was initially lower with surgery, but not at 12 months. AHI did not differ significantly initially but did so after 12 months in favour of OA.

• Conclusions
  – It is appropriate to offer OA therapy to patients with mild symptomatic OSAH and to patients who are unwilling or unable to tolerate CPAP therapy. Long-term data on cardiovascular health are required.
CPAP Reduces Fatigue And Sleepiness In OSA

• Methods
  – Fifty-nine men and women with OSA were randomly assigned to therapeutic or placebo CPAP in a double-blind fashion for a 3-week intervention period.

• Results
  – CPAP showed significant reductions in the apnea-hypopnea index, as well as decreases in both measures of fatigue and increases in vigor (P values < 0.05). The beneficial effect of therapeutic treatment was most pronounced in patients with high levels of fatigue at study onset. A subset of patients with excessive sleepiness at the onset of treatment, ESS scores were significantly reduced with CPAP.

• Conclusions
  – 3 weeks of therapeutic CPAP significantly reduced fatigue and increased energy in patients with OSA. Therapeutic CPAP significantly reduced daytime sleepiness in patients who reported excessive sleepiness at the onset of treatment.

  In another study Antic found that a substantial proportion of patients will not normalize neurobehavioral responses despite adequate CPAP use.

CPAP Reduces Car Crash Risk For OSA

• Methods and Results
  – A meta-analysis of 9 observational studies examining crash risk of drivers with OSA pre- vs. post-CPAP found a significant risk reduction following treatment (risk ratio = 0.278). Although crash data are not available to assess the time course of change, daytime sleepiness improves significantly following a single night of treatment, and simulated driving performance improves significantly within 2 to 7 days of CPAP treatment.

• Conclusions
  – Observational studies indicate that CPAP reduces motor vehicle crash risk among drivers with OSA.
CPAP Improves Sexual Function

**Methods**
- RCT to investigate efficacy of continuous positive airway pressure (CPAP) therapy on erectile dysfunction in patients with severe obstructive sleep apnea syndrome. CPAP vs antidepressant medication for one month.

**Results**
- After 1 month of regular CPAP usage, International Index of Erectile Function IIEF-5 mean score was 15.71+/-5.12 before CPAP and improved to 19.06+/-3.94, statistically significant. All subjects responded positively to the CPAP treatment and their erection status was improved positively.

**Conclusion**
- There is an association between severe OSA and ED. CPAP is effective in improvement of sexual performance of these patients.


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Weight Loss Works For Sleep Apnea

**Participants**
- 63 men aged 30-65 with body mass index (BMI) 30-40 and moderate to severe obstructive sleep apnea treated with CPAP.

**Intervention**
- A one year weight loss program, with stringent initial diet

**Results**
- Of 63 eligible patients, 58 completed the very low energy diet period and started the weight maintenance program and 44 completed the full program; 49 had complete measurements at one year. Baseline mean apnea-hypopnea index: 36 events/hour. After one year the apnea-hypopnea index had improved by -17 events/hour (-13 to -21) and body weight by -12 kg (-10 to -14) compared with baseline (both P<0.001). At one year, 30/63 no longer required CPAP and 6/63 had total remission (apnea-hypopnea index <5 events/hour).

**Conclusion**
- Initial improvements in obstructive sleep apnoea after treatment with a very low energy diet can be maintained after one year in obese men with moderate to severe disease.
- In Toumilleto’s study of 81 obese patients with mild sleep apnea, weight loss eliminated sleep apnea in almost two thirds of patients.

Johansson K et al Longer term effects of very low energy diet on obstructive sleep apnoea in cohort derived from randomised controlled trial: prospective observational follow-up study. BMJ. 2011 Jun 1;342:d3017. doi: 10.1136/bmj.d3017

Bariatric Surgery Does Not Cure Sleep Apnea

• Methods
  – Meta-analysis of 12 studies with 342 patients

• Results
  – The pooled mean body mass index was reduced by 17.9 kg/m² from 55.3 to 37.7.
  – The baseline apnea-hypopnea index of 54.7 events/hr was reduced by 38.2 events/hour to a final value of 15.8 events/hr.

• Conclusion
  – Bariatric surgery significantly reduces the apnea hypopnea index, but the mean index after surgical weight loss was consistent with moderately severe OSA. Patients undergoing bariatric surgery should not expect a cure of OSA after surgical weight loss.

CPAP Reduces BP In Resistant Hypertension

• Methods
  – 75 patients with resistant hypertension and OSA with an apnea-hypopnea index at least 15 events/hr were randomized to receive either CPAP added to conventional treatment (n = 38) or conventional medical treatment alone (n = 37).

• Results
  – Sixty-four patients completed the follow-up. Patients with ABPM-confirmed resistant hypertension treated with CPAP (n = 20), unlike those treated with conventional treatment (n = 21), showed a decrease in 24-h diastolic BP of -4.9 ± 6.4). Patients who used CPAP > 5.8 h showed a greater reduction in daytime diastolic BP of -6.1 and systolic BP -9.7.

• Conclusion
  – In patients with resistant hypertension and OSA, CPAP treatment for 3 months achieves reductions in 24-h BP.
Small Decrease In BP With CPAP In OAS

- **Methods**
  - 340 patients recently diagnosed as having systemic HTN and OSA were assigned to CPAP (n=169) or sham CPAP (n=171) for 3 months.

- **Results**
  - 277 (81%) of 340 patients were men; the mean age was 52.4 years, mean BMI was 31.9, Epworth sleepiness scale score was 10.1, and apnea-hypopnea index of 43.5 (24.5). Compared with placebo, the mean 24 hour ambulatory blood pressure of the CPAP group decreased by 1.5 mm Hg. The mean 24 hour ambulatory blood pressure monitoring measures decreased by 2.1 mm Hg for systolic pressure and 1.3 mm Hg (P=0.02) for diastolic blood pressure. Mean nocturnal blood pressure decreased by 2.1.

- **Conclusion**
  - Minimal BP decrease with CPAP at 3 months.

- In similar study of 359 patients, Barber had very similar results.

Durán-Cantolla J et al Spanish Sleep and Breathing Group. Continuous positive airway pressure as treatment for systemic hypertension in people with obstructive sleep apnoea randomised controlled trial. BMJ. 2010 Nov 24;341:c5991. doi: 10.1136/bmj.c5991

Sleep Apnea and Type 2 Diabetes Mellitus

- 60 patients with type 2 diabetes evaluated
- 46 (77%) of them had obstructive sleep apnea

- After controlling for age, sex, race, body mass index, number of diabetes medications, level of exercise, years of diabetes, and total sleep time, compared with patients without obstructive sleep apnea, the adjusted mean hemoglobin A1c was increased in a linear trend by:
  - 1.49% in patients with mild obstructive sleep apnea (P = .0028)
  - 1.93% in patients with moderate obstructive sleep apnea (P = .0033)
  - 3.69% in patients with severe obstructive sleep apnea (P < .0001)

- BUT, in another recent meta-analysis of 5 studies by Hecht, CPAP did not influence plasma insulin levels nor HOMA-index, adiponectin levels or HbA1c values, but did improve insulin sensitivity in one study only.

CPAP for Metabolic Syndrome

• Methods
  – In a double-blind, placebo-controlled trial, randomly assigned patients with obstructive sleep apnea syndrome to undergo 3 months of therapeutic CPAP followed by 3 months of sham CPAP, or vice versa, with a washout period of 1 month in between.

• Results
  – 86 patients completed the study, 75 (87%) of whom had the metabolic syndrome. CPAP treatment (vs. sham CPAP) was associated with significant mean decreases in systolic blood pressure (3.9 mm Hg), diastolic blood pressure (2.5 mm Hg), serum total cholesterol (13.3 mg/dl), non-high-density lipoprotein cholesterol (13.3 mg/dl), low-density lipoprotein cholesterol (9.6 mg/dl), triglycerides (18.7 mg/dl), and glycated hemoglobin (0.2%).

• Conclusions
  – In patients with moderate-to-severe obstructive sleep apnea syndrome, 3 months of CPAP therapy lowers blood pressure and partially reverses metabolic abnormalities.

Guideline for Sleep Apnea in Children

Major Recommendations
• It is strongly recommended, for families of children with obstructive sleep apnea (OSA), that long-term outcomes of treatment with surgery or continuous positive airway pressure be discussed.

Quality of Life
• For children 1 to 17 years of age with obstructive sleep apnea, significantly statistical improvement in the following parameters has been measured at least 6 months, and as long as 5 years, after adenotonsillectomy (T&A) or with continuous positive airway pressure (CPAP) treatment:
  • Sleep disturbance
  • Physical suffering
  • Sleep breathing and loudness of snoring
  • Emotional distress
  • Excessive daytime sleepiness
  • Speech and swallowing difficulties
  • Daytime problems
  • Caregiver concerns
Guideline for Sleep Apnea in Children

Neurocognitive Behavior

- For children 2 to 18 years of age with sleep disordered breathing (SDB) and/or obstructive sleep apnea, significantly statistical improvement in the following behavioral abnormalities has been measured at least 6 months, and as long as 18 months, after T&A:

  - Attention deficit, hyperactivity
  - Daytime sleepiness
  - Aggression
  - Somatization
  - Atypicality
  - Behavioral symptoms index (BSI)
  - Depression
  - Externalizing and internalizing problems
  - Somnolence
  - Academic difficulties

T&A Improves But Does Not Cure OSA In Kids

- **Methods**
  - Meta-analysis of 4 studies with 110 children of T&A and OSA

- **Results**
  - Mean body mass index z score was 2.81. Mean pre- and postoperative apnea-hypopnea index (AHI) was 29.4 and 10.3, respectively. Weighted mean difference between pre- and postoperative AHI was a significant reduction of 18.3 events per hour.

- **Conclusions**
  - T&A improves but does not resolve OSA in majority of obese children. Efficacy and role of additional therapeutic options require more study.

- In another meta-analysis of 10 before and after studies, Baldasari found large improvements in quality of life after adenotonsillectomy, and these findings were maintained in the long-term. But there were no control trials on QOL in pediatric OSA.


Sleep Hygiene

Sleep Recommendations From The NIH

Sleep Hygiene Tips

- Establish a regular routine that includes going to bed and getting up at the same time every day, even on weekends. Maintaining a consistent sleep-wake cycle is the key to better health overall.
- Get an adequate amount of sleep every night. Determine the amount of sleep you need by keeping track of how long you sleep without using an alarm clock for a week. Maintain this "personal" sleep requirement.
- Go to bed when you are sleepy. If you have difficulty falling asleep or wake up shortly after going to sleep, leave the bedroom and read quietly or do some other relaxing activity. Avoid bright lights as this can cue your wake cycle.
- Develop sleep rituals before going to bed. Do the same things in the same order before going to bed to cue your body to slow down and relax.
- Avoid stress and worries at bedtime. Address tomorrow's activities, concerns, or distractions earlier in the day. Certain activities, such as listening to soft music, reading, or taking a warm bath, can help you wind down.
- Use your bed for sleeping and sex only. Often, doing other activities in bed like watching TV, paying bills, or working only serve to initiate worries and concerns. Let your mind associate the bed with sleeping, relaxing, and pleasure.
- Avoid heavy meals late in the evening; similarly, avoid going to bed hungry. A light snack, especially dairy foods, can help you sleep.

- Reduce your intake of caffeine and nicotine 4-6 hours before going to sleep. Stimulants interfere with your ability to fall asleep and progress into deep sleep. 200mg caffeine (a large Starbucks coffee) taken at 8AM will impair the sleep architecture that night.
- Avoid alcohol 4-6 hours before bedtime. As a depressant that slows brain activity, alcohol may initially make you tired, but you will end up having fragmented sleep. In addition, being tired intensifies the effects of alcohol. Alcohol also aggravates snoring and sleep apnea particularly in men.
- Exercise regularly. Regular exercise, even for 20 minutes, 3 times a week, promotes deep sleep.
- Don't nap for more than 30 minutes or after 3 p.m. Avoiding naps all together will ensure that you are tired at night. Longer naps disrupt the body's ability to stay asleep.
- Maintain a dark, quiet room to sleep in at a temperature with which you are comfortable.
- Use sleeping aids conservatively, and avoid using them for more than one or two nights per month. Avoid sleeping pills altogether if you have obstructive sleep apnea because it can be a deadly combination.
Brief Behavioral Therapy Diminishes Insomnia In The Elderly

• Methods
  – The researchers identified 82 older patients (mean age = 72 years) with chronic insomnia who were willing to keep a sleep diary and have in-home polysomnography. The patients were assigned to receive self-help books or to have brief behavioral therapy. The behavioral therapy was delivered by a nurse practitioner with no previous experience in behavioral interventions for insomnia. The therapy included instructions to get up at the same time each day, to go to bed only when sleepy, and to get out of bed if you are not sleeping. No cognitive behavioral therapy was provided. These instructions were provided in 2 face-to-face sessions, supplemented by 2 phone sessions.

• Results
  – After 4 weeks, significantly more patients in the behavioral therapy group reported "no insomnia" (55% vs 13%; P < .001) and significantly more had a defined response to treatment (67% vs 25%; P < .001). No change was seen with polysomnography.

CBT and/or Zolpidem For Chronic Insomnia

• Methods
  – 180 adults (mean age = 50.3 years) with chronic insomnia (mean duration = 16.4 years). Randomized to receive CBT alone or CBT plus zolpidem 10 mg nightly. CBT consisted of standard instructions to (1) go to bed only when sleepy; (2) use the bed and bedroom only for sleep and sex (ie, no reading, TV watching, or worrying); (3) get out of bed and go to another room when unable to fall asleep or return to sleep within 20 minutes, and return to bed only when sleepy again; and (4) arise at the same time every morning. CBT also directed individual patients to alter faulty beliefs and misconceptions about sleep and to develop coping methods for insomnia and worry.

• Results
  – CBT and CBT plus zolpidem resulted in similar response and remission rates after initial 6 weeks of treatment. However, remission did occur significantly more often after 6 months in patients receiving combined therapy of CBT plus zolpidem than in those receiving CBT alone (56% vs 43%; NNT= 8).

• Bottom line
  – In this study cognitive behavioral therapy (CBT) alone and CBT plus zolpidem (Ambien) were equally effective for the treatment of chronic insomnia after 6 weeks of acute therapy; CBT plus zolpidem had a slight edge at 6 months.
Acupuncture For Insomnia: Meta-analysis

• Methods
  – Seven trials met the inclusion criteria and included 590 participants age 15 to 98 years, and the duration of insomnia varied from 6 months to 19 years. Many acupuncture methods used; could not do formal meta-analysis

• Results
  – acupuncture and acupressure may help to improve sleep quality scores when compared to placebo (SMD = -1.08) or no treatment (SMD = -0.55). However, the efficacy of acupuncture or its variants was inconsistent between studies for many sleep parameters.

• Authors’ conclusions
  – The small number of randomized controlled trials, together with the poor methodological quality and significant clinical heterogeneity, means that the current evidence is not sufficiently extensive or rigorous to support the use of any form of acupuncture for the treatment of insomnia.

Web-Based Behavioral Interventions for Insomnia

Sustained reduction in insomnia severity with web-based CBTi vs. controls
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Sleep Disorders Resources

- National Sleep Foundation
  - www.sleepfoundation.org
- American Insomnia Association
  - www.americaninsomniaassociation.org
- American Sleep Apnea Association
  - www.sleepapnea.org
- Narcolepsy Network
  - www.narcolepsynetwork.org
- Restless Legs Syndrome Foundation
  - www.rls.org

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