THE EYE IN SLEEP APNEA

1. INTRODUCTION
   A. Sleep Apnea Defined
      i. Sleep apnea syndrome (SAS) is a disease characterized by recurrent complete or partial upper airway obstructions during sleep. It is characterized by cessation of breathing during sleep, known as periods of apnea.
      1. Clinically, apnea is defined as complete cessation of breathing for more than 10 s in adults
      ii. The majority of patients with SAS demonstrate this obstruction either at the nasopharynx or the oropharynx.
      iii. Risk factors for SAS include:
         1. Obesity
         2. Male sex
         3. Upper airway abnormalities
         4. Alcohol use
         5. Snoring
         6. Neck girth of more than 17 in. in men or 16 in. in women.
   B. SAS describes two major sleep-related clinical problems
      i. Central sleep apnea
         1. Central sleep apnea is caused by the loss of ventilatory effort controlled by the nervous system.
      ii. Obstructive sleep apnea (OSA).
         1. OSA is caused by upper airway obstruction.
         2. However, the mechanisms underlying these different types of sleep apnea are likely to overlap.
   C. Epidemiology
      i. The prevalence of sleep-disordered breathing is approximately 2% in women and 4% in men between 30 and 60 years of age.
      ii. The majority of patients with SAS are diagnosed with OSA, the most common form of sleep apnea. Genetics have been found to be a factor.
      iii. Physical obstruction of the airway can result from a variety or combination of anatomical factors:
         1. Enlarged tonsils
         2. Enlarged uvula
         3. Increased tongue size
         4. Abnormal craniofacial morphology
D. Systemic Complications of SAS
   i. Systemic arterial hypertension
      1. Present in about 50% of obstructive sleep apnea cases
   ii. Congestive heart failure
   iii. Pulmonary hypertension
   iv. Stroke
   v. Metabolic syndrome
   vi. Type 2 diabetes mellitus

2. OPHTHALMIC ASSOCIATIONS AND COMPLICATIONS
   A. Reported ophthalmic findings in patients with SAS include
      i. Floppy eyelid syndrome (FES)
         1. Diagnosis
         2. Treatment/management
         3. Evidence of association with SAS
      ii. Glaucoma
         1. Diagnosis
         2. Treatment/management
         3. Evidence of association with SAS
      iii. Non-arteritic anterior ischemic optic neuropathy (NAION)
         1. Diagnosis
         2. Treatment/management
         3. Evidence of association with SAS
      iv. Keratoconus
         1. Diagnosis
         2. Treatment/management
         3. Evidence of association with SAS
      v. Marfan’s Syndrome-related Complications
         1. Ectopia lentis
            a. decentered crystalline lens, secondary to disruption of the surrounding zonular fibers
            b. Patients with ectopia lentis are at an increased risk for retinal detachment
   B. Other Related Ocular Disease
      i. Diabetic retinopathy
      ii. Hypertensive retinopathy
      iii. Retinal vascular occlusions
      iv. Central serous chorioretinopathy
C. The Sleep History for Optometrists
   i. A brief sleep history in the eye clinic may consist of the following questions:
      1. Do you have trouble sleeping at night? Why (heart failure, urination, other)?
      2. Does someone sleep close enough to you to hear any nighttime noise, such as snoring?
      3. Are you sleepy during the daytime or do you fall asleep at times when you should not?
      4. Do you snore or have frequent awakenings? Why (heart failure, urination, and so forth)?
      5. Do you have frequent headaches, especially in the morning after awakening?
      6. Do you have a known sleep disorder or have you ever had a sleep study (polysomnography)?

D. Treatment and Management
   i. Weight reduction
   ii. All patients should be offered nasal CPAP therapy first.
   iii. In patients with mild-to-severe obstructive sleep apnea who refuse or reject nasal CPAP therapy, BiPAP therapy should be tried next.
      1. If this therapy fails or is rejected, oral appliance (OA) therapy should be considered.
   iv. OAs may be considered first-line therapy for patients with mild OSA, particularly if they are unwilling to try nasal CPAP therapy.
   v. Patients in whom noninvasive medical therapy (eg, CPAP, BiPAP, OAs) fails should be offered surgical options.
      1. Patients should be made aware of the success rates for each surgical procedure.
      2. They should be informed that they might require more than 1 surgical procedure, some fairly extensive.
      3. Refer patients only to centers that have personnel experienced in these special surgical techniques.

E. Conclusions
   i. A growing body of literature in the fields of sleep medicine and ophthalmic disorders provides evidence that suggests an association between sleep apnea syndrome and ocular problems.
   ii. Increased awareness of ocular problems associated with SAS will result in more cross-referrals between sleep specialists and ophthalmic clinicians.
      1. ODs should refer their patients with these ocular entities for a sleep study, particularly if the patient fits the demographic profile or complains of sleep disturbances.
      2. Similarly, sleep medicine specialists should recommend that all their patients have a thorough ocular health examination.