Stroke:
Sleep Apnea and Bariatric Issues

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We will learn that

- Obesity is widespread
- Obesity increases the risk of stroke
- Obesity may affect prognosis after stroke
- Obesity is linked to sleep apnea
- Sleep apnea can cause stroke
- Sleep apnea is very common after stroke
- Diagnosis of sleep apnea is important
- Treatment of sleep apnea in patients with stroke may improve outcomes
Obesity is widespread

- Obesity is a global epidemic
- The long-term risks for overweight or more or obesity exceeded 50% and 25%

- Framingham Heart Study population
Overweight and Obesity

• Screening for overweight and obesity should include measurement of--
  • Body mass index (BMI)
  • Waist circumference, and
  • Evaluation of overall medical risk
Classification of BMI

- Underweight — BMI < 18.5 kg/m²
- Normal weight — BMI ≥ 18.5 to 24.9 kg/m²
- Overweight — BMI ≥ 25.0 to 29.9 kg/m²
- Obesity — BMI ≥ 30 kg/m²
- Obesity Class I — BMI of 30.0 to 34.9 kg/m²
- Obesity Class II — BMI of 35.0 to 39.9 kg/m²
- Obesity Class III — BMI ≥ 40 kg/m².

- Obes Res. 1998;6 Suppl 2:51S
Obesity increases the risk of stroke

• Overweight and obesity are associated with progressively increasing risk of ischemic stroke, at least in part, independently from age, lifestyle, and other cardiovascular risk factors

• Meta-analysis of prospective studies with 2 million participants

• STROKE, 2010 May; 41(5): e418-26
Northern Manhattan Stroke Study

• Abdominal obesity is an independent, potent risk factor for ischemic stroke in all race-ethnic groups
• It is a stronger risk factor than BMI and has a greater effect among younger persons

• STROKE, 2003 Jul; 34(7): 1586-92
The ARIC study

- The incidences of lacunar, nonlacunar, and cardioembolic stroke were all significantly positively associated with the degree of obesity
- 13549 black and white adults who were aged from 45 to 64 years and had no history of cardiovascular disease or cancer
- The incidence of ischemic stroke subtypes was ascertained from surveillance of hospital records over a median follow-up of 16.9 years
Women are having more strokes

• Stroke prevalence among women aged 35 to 54 years has tripled over the past 2 decades, at the same time remaining stable among men.

• Prevalence of obesity and 3 metabolic syndrome components increased; they may be key factors in the increase in women's stroke prevalence.

• Stroke 2010 Jul; Vol. 41 (7), pp. 1371-5
Obese stroke has poor outcomes in young patients

• Higher BMI after stroke is associated with a greater risk of all-cause and cardiovascular death among younger individuals

• Younger stroke survivors may especially benefit from more vigorous efforts to monitor and treat obesity

• STROKE, 2009 Aug; 40(8): 2704-8
The Obesity-Stroke Paradox

- Based on BMI estimation, obese and overweight stroke patients have significantly better early and long-term survival rates compared to those with normal BMI

- Stroke 2011 Jan; Vol. 42 (1), pp. 30-6
The PREMIER study

• As reflected by WHtR, the excess of adiposity increases the chance of severe disability after ischemic stroke

• Since BMI reflects also total lean mass, it is risky to conclude that there is a protective effect of obesity alone in the functional recovery after stroke

• Nevertheless, it is possible that a certain magnitude of body mass is necessary to prevent severe disability in stroke survivors

• Rev Neurol 2010 Dec 16; Vol. 51 (12), pp. 705-13
Obesity causes OSA

- Risk of OSA increases with higher BMI
- Obesity is a risk factor for obstructive sleep apnea
- Obesity may also be a consequence of obstructive sleep apnea
- Other factors are—
  - Upper airway anatomy
  - Muscle tone
OSA is underdiagnosed

- >85% of patients with clinically significant and treatable OSA have never been diagnosed
- Referral populations of OSA patients represent only the "tip of the iceberg" of OSA prevalence.
STOP Questionnaire

• The four simple questions are:
  • Snoring
  • Tiredness during daytime
  • Observed apnea, and
  • Pressure elevation (hypertension)
Difficulty in diagnosis

• For a given severity of OSA, patients with stroke had less daytime sleepiness and lower body mass index than subjects without stroke.

• These factors may make the diagnosis of OSA elusive in the post stroke period and preclude many such patients from the potential benefits of OSA therapy.

• Stroke 2010 Mar; Vol. 41 (3), pp. e129-34.
OSA and SWD are common

• Sleep-related breathing and sleep-wake disturbances in ischemic stroke

• Hermann and Bassetti *Neurology*. 2009; 73: 1313-1322
Recommendation

• SDB, presenting with obstructive, central, or mixed apneas, is present in 50%–70% of stroke patients

• We recommend screening for SDB in all stroke patients
Obstructive Sleep Apnea as a Risk Factor for Stroke and Death

H. Klar Yaggi, M.D., M.P.H., John Concato, M.D., M.P.H., Walter N. Kernan, M.D., Judith H. Lichtman, Ph.D., M.P.H., Lawrence M. Brass, M.D., and Vahid Mohsenin, M.D.
• Among 1022 enrolled patients, 697 (68 percent) had the obstructive sleep apnea syndrome

• At baseline, the mean apnea–hypopnea index in the patients with the syndrome was 35, as compared with a mean apnea–hypopnea index of 2 in the comparison group

• In an unadjusted analysis, the obstructive sleep apnea syndrome was associated with stroke or death from any cause (hazard ratio, 2.24; 95 percent confidence interval, 1.30 to 3.86; P=0.004).
Can OSA cause Stroke?

• Obstructive Sleep Apnea–Hypopnea and Incident Stroke: The Sleep Heart Health Study

Large Study of 5000 patients over 9 years

- 5,422 participants
- No stroke at baseline
- Untreated sleep apnea
- 9 year follow up
- 193 ischemic strokes were observed
OSA is a risk factor for stroke

• A significant positive association between ischemic stroke and OAHI was observed in men ($P$ value for linear trend: $P = 0.016$).

• Men in the highest OAHI quartile (>19) had an adjusted hazard ratio of 2.86 (95% confidence interval, 1.1–7.4).

• In the mild to moderate range (OAHI, 5–25), each one-unit increase in OAHI in men was estimated to increase stroke risk by 6% (95% confidence interval, 2–10%).

• In women, stroke was not significantly associated with OAHI quartiles, but increased risk was observed at an OAHI greater than 25.
Possible mechanisms of OSA as a risk factor for stroke

- Acute hemodynamic changes
- Decreased cerebral blood flow
- Paradoxical embolization
- Hypercoagulability, platelet activation
- Endothelial dysfunction
- Hypoxia-related cerebral ischemia, and
- Atherosclerosis
Brain death by a thousand hypoxic cuts in sleep

• Serum levels of sCD40L and sP-selectin are elevated and SBI is more common in patients with moderate to severe OSA, leading to elevated cerebrovascular morbidity.

• Moreover, nCPAP reduces sCD40L and P-selectin and may be useful for decreasing risk in patients with moderate to severe OSA

• AM J RESPIR CRIT CARE MED, 2007 Mar 15; 175(6): 612-7
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