

# Management of Obstructive Sleep Apnea

**Dr VK Vijayan**

**MD (Med), PhD (Med), DSc,  
FCCP, FICC, FAPSR, FAMS**

**Advisor to Director General, ICMR**

**Bhopal Memorial Hospital and Research Centre &  
National Institute for Research in Environmental  
Health (ICMR), Bhopal**

**&**

**Former Director**

**Vallabhbhai Patel Chest Institute**

**University of Delhi**

# Treatment

- **Weight reduction**
- **Lifestyle modification**
- **Continuous positive airway pressure (CPAP)**
- **Bilevel positive airway pressure (BiPAP)**
- **Oral appliances- To keep upper airway open**
- **Medical therapy**
- **Surgical treatment**

# Treatment of OSA

- **Treatment depends on the severity of the sleep-disordered breathing**
- **People with mild apnea have a wider variety of options**
- **People with moderate-to-severe apnea should be treated with nasal continuous positive airway pressure (CPAP)**

# Weight Reduction

- **Obesity is a major predictive factor for OSA**
- **Weight loss should be recommended to overweight patients with OSA**
- **Loss of body weight as little as 10% is associated with clinically significant improvement (26%) in apnea-hypopnea index**
- **Long term effects of methods of weight loss (bariatric surgery and carbohydrate-restricted diets) are not assessed in longitudinal studies**

# Benefits of weight reduction

- **Decreased respiratory disturbance index (RDI)**
- **Lowered blood pressure**
- **Improved pulmonary function and arterial blood gas values**
- **Improved sleep structure and snoring**
- **Possible reduction of optimum CPAP pressure required**

# Lifestyle Modification

- **Avoidance of alcohol for 4-6 hours prior to bedtime**
- **Avoid using other sedatives known to make apnea worse**
- **Smoking cessation; smoking increases the risk of snoring and apnea**
- **Sleeping on one's side rather than on the stomach or back**
- **Avoid sleep deprivation**

# Mechanical Devices for Treatment

- **Continuous positive airway pressure (CPAP): standard treatment for OSA**
- **Bilevel positive airway pressure (BiPAP)**
- **Oral appliances (OA)**

# **Treatment of OSA: From least invasive and effective to most invasive and effective**

- **Offer nasal CPAP therapy first to all patients**
- **Patients with mild-to-severe OSA who refuse or reject nasal CPAP therapy, offer BiPAP**
- **If BiPAP fails or is rejected, offer OA therapy**
- **OA can be first-line therapy in mild OSA, if they are unwilling to try nCPAP**
- **Attempt all interventions to improve tolerance to CPAP before deciding its failure**
- **Surgical options are offered only if noninvasive medical therapy (CPAP, BiPAP, OAs) has failed**



# Guidelines for CPAP Treatment

- **All patients with an apnea-hypopnea index (AHI) greater than 15 are eligible for CPAP, regardless of symptomatology because of the increased risk of cardiovascular morbidity**
- **CPAP is indicated in patients with an AHI of 5-14.9, if the patient has one of the following: excessive daytime sleepiness (EDS), hypertension, or cardiovascular disease**

# CPAP Titration

- **Titration is usually done by a trial and-error process, adjusting the applied pressure until those respiratory and sleep parameters considered to be clinically important are reduced to the degree judged to be acceptable.**

# Outcome of CPAP Treatment

- **Optimal treatment of OSA with CPAP**
  - i. **Corrects OSA first**
  - ii. **Upper airway resistance syndrome next**
  - iii. **Snoring last**
- **If all 3 problems are not eliminated, symptoms can recur**

# Autotitrating PAP (APAP)

- **Fixed-pressure CPAP therapy is effective in most patients with OSAH**
- **However, the application of a single pressure value over time has potential drawbacks because the collapsibility of the upper airway varies not only during a single night but also long term**
- **ACPAP devices modifies the applied pressure in real time, according to that required to maintain upper airway patency**
- **In theory, at any given time, these devices apply the lowest effective pressure**

# Effectiveness of CPAP Therapy

- **Adequate levels of nCPAP during sleep resolves:**
  - obstructive apnea and/or hypopnea,**
  - oxyhemoglobin desaturation,**
  - snoring from sleep.**
- **Results in adequate sleep continuity**
- **Improve daytime sleepiness, mood, and cognitive function in people with both mild and moderate apnea**

# Effectiveness of CPAP Therapy

- **CPAP has also been shown to decrease blood pressure, primarily in patients with severe OSA**
- **Improve the left ventricular ejection fraction in patients with congestive heart failure and OSA**
- **CPAP plus an antihypertensive medication may synergistically improve systemic hypertension**
- **It improves right-side heart function and pulmonary hypertension**

# Effectiveness of CPAP Therapy

- **CPAP is associated with a lower risk for heart disease, stroke, and diabetes**
- **CPAP has also been shown to increase quality of life**
- **Decreases health care costs**
- **CPAP reduces mortality in OSA**

# Adherence to CPAP Therapy

- **The use of CPAP > 6 hours decreases sleepiness, improves daily functioning, and restores memory to normal levels**
- **Adherence to CPAP therapy is defined as greater than 4 hours of nightly use**
- **46 to 83% of patients with obstructive sleep apnea have been reported to be nonadherent to treatment.**

**Weaver TE and Grunstein RR. Proc Am Thorac Soc 2008; 5: 173-178**



# Interventions to Improve CPAP Adherence

- Humidification of the Airway
- Machine Design

**Bilevel CPAP, auto-CPAP**(developed to vary and optimize the level of CPAP through the night), or **flexible CPAP** (alternates airway pressure between exhalation and inhalation on a breath-by-breath basis to improve patient comfort).

- Behavioral Interventions

**Cognitive behavioral therapy**

(Weaver TE and Grunstein RR. Proc Am Thorac Soc 2008; 5: 173-178)

# Interventions to Improve CPAP Adherence

- **CPAP adherence tracking transmission systems**
  - Cards (smart cards or SD cards)**
  - Memory sticks or**
  - Wireless transmission**
- **Data that they track are**
  - Adherence**
  - Leak**
  - Efficacy**
  - Flow signals**

(An Official American Thoracic Society Statement: Am J Respir Crit Care Med 2013; 188: 613-620)

# Complications of CPAP

- **A sensation of suffocation**
- **Claustrophobia**
- **Difficulty exhaling**
- **Inability to sleep**
- **Musculoskeletal chest discomfort**
- **Aerophagia, and sinus discomfort**
- **Very rarely Pneumothorax and/or pneumomediastinum**
- **Noise and spousal intolerance**

# BiPAP Treatment

- **CPAP delivers a constant pressure during both inspiration and expiration**
- **BiPAP permits independent adjustment of the pressures delivered during inspiration and expiration**
- **BiPAP is used in patients:**
  - i. who cannot tolerate high CPAP pressures**
  - ii. who have barotrauma complications (eg, ear infections, bloating)**
  - iii. if the CPAP level needs to be increased above 15 cm water**
- **it has no distinct advantages over CPAP therapy**

# Indications for Oral Appliances

- **Patients with mild-to-moderate OSA**
  1. **who prefer oral appliances to CPAP devices**
  2. **who do not respond to CPAP therapy**
  3. **in whom treatment attempts with CPAP devices fail**
- **Should not be considered effective therapy for patients with severe OSA**

# Oral Appliance Therapy

- **Oral appliances act by:  
moving (pulling) the tongue forward  
or  
moving the mandible and soft palate  
anteriorly**
- **These devices enlarge the posterior  
airspace**
- **Multiple different devices are available**

# Basic Designs of Oral Appliances

- **Three basic designs are used to treat sleep-related breathing disorders (SRBD):**
  - i. mandibular repositioners**
  - ii. tongue-retaining devices (TRDs)**
  - iii. palatal-lifting devices**
- **More than 40 OAs are available to manage sleep-related breathing disorders (SRBD) and obstructive sleep apnea.**

# Contraindications for OA treatment

- **Less than 6-10 teeth in each arch**
- **Patient unable to protrude the mandible forward and open the jaw widely**
- **Preexisting temporomandibular joint problems**
- **Severe bruxism**
- **Patient with full dentures (cannot use a mandibular repositioner but could use a TRD)**



# Complications of Oral Appliances

- **Excessive salivation**
- **Dental misalignment with bite change and tooth movement**
- **Temporo-mandibular joint (TMJ) disease,**
- **Myofascial pain, tooth pain, gum irritation, salivation, TMJ sounds**
- **Tongue pain (most common with tongue retaining devices (TRDs))**
- **Patients may also object to having an appliance in their mouth throughout the night.**

# Medical Therapy: Pharmacologic Agents

- **Serotoninerbic agents (fluoxetine, paroxetine, mitrazapine)**
- **REM sleep suppressant therapy (protriptyline, clonidine)**
- **Ventilatory stimulants [methyl xanthine derivatives, opioid antagonists (naloxone), doxopram, nicotine]**
- **Hormone treatment (medroxyprogesterone and estrogen)**
- **Endocrinological disorders (thyroid hormone replacement, Growth hormone suppressant)**
- **Wake promoting agents (modafinil)**

# Wake Promoting Agents (Modafinil)

- **Despite treatment with CPAP, many patients demonstrate residual sleepiness**
- **Modafinil is a wake-promoting agent which has been approved for the treatment of narcolepsy**
- **In a randomized, double blind, placebo-controlled parallel group trial, modafinil (200 mg/day week 1 and then 400 mg/day weeks 2-4), significantly improved daytime sleepiness, but no effect on AHI**
- **Adult patients with OSA having excessive somnolence despite well treated with CPAP**

**(Pack AI et al. Modafinil as adjunct therapy for daytime sleepiness in obstructive sleep apnea. Am J Respir Crit Care Med 2001; 164: 1675–81)**

# Medical Therapy:

- **Supplemental oxygen**

**Supplemental nocturnal oxygen therapy improves oxygen saturation levels but does not improve airway patency.**

- **Therapies intended to improve nasal patency**

**Patients with OSA and coexisting rhinitis may benefit from the use of nasal corticosteroids.**

- **Positional therapies**

**Lateral positioning therapy has been found to improve AHI**

# **Surgical Treatment**

- **Tracheotomy (Upper airway bypass)**
- **Adeno-tonsillectomy**
- **Procedures for nasal obstruction**
  - Septoplasty**
  - Nasal polypectomy**
  - Radiofrequency ablation of turbinates**
- **Reduction of soft palate redundancy**
  - Uvulopalatopharyngoplasty**
  - Uvulopalatal flap**
  - Palatal advancement**
  - RF ablation of the soft palate**

# Surgical Treatment

- **Reduction of the bulk of the tongue base to prevent hypopharyngeal or retrolingual obstruction**

**Genioglossal advancement**

**Hyoid suspension**

**Partial glossectomy**

**Tongue RF ablation**

**Lingualplasty**

**Maxillo-mandibular advancement**

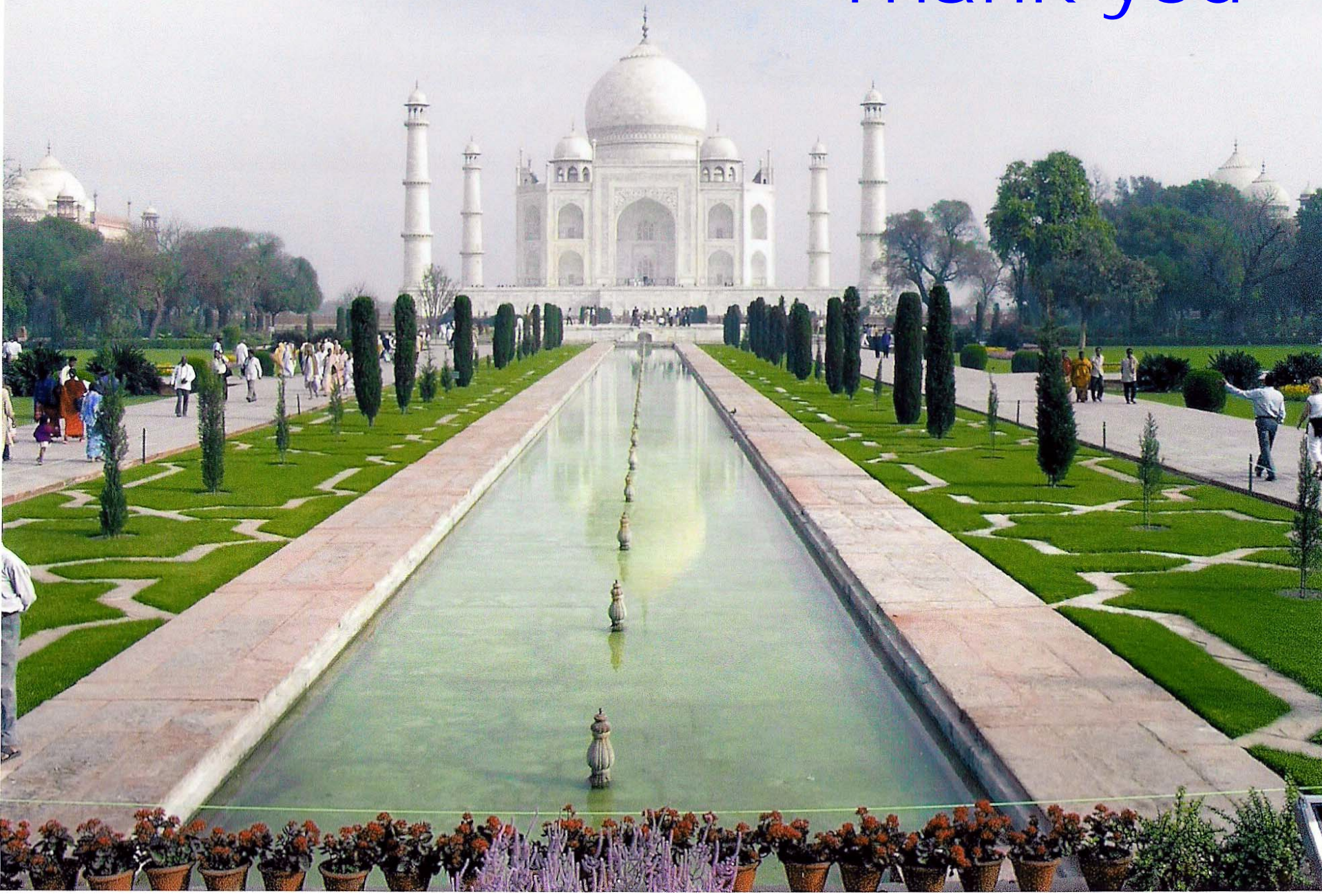
- **Laryngeal procedure: Epiglottoplasty**
- **Bariatric surgery**

# Hypoglossal Nerve Stimulation (HGNS)

- 30 middle-aged patients with OSA who could not tolerate CPAP
- Implantation of a neurostimulator and respiration sensing lead under GA
- Stimulating lead is placed on the hypoglossal nerve to stimulate the nerve during inspiration
- Progressive increase in inspiratory airflow with increasing stimulation intensity, producing opening of the airway

(Schwartz AR et al. Am J Respir Crit Care 2012; 185: 420-426)

Thank you





# Features associated with Metabolic Syndrome

- **Pro inflammatory state**
- **Pro Thrombotic state**
- **Hyperleptinemia**
- **Hypoadiponectinemia**
- **Hyperuricemia**
- **Endothelial dysfunction**
- **Microalbuminuria**

# Core Components of Metabolic Syndrome

- **Abdominal obesity**
  - **Insulin resistance or glucose intolerance**
  - **Hypertension**
  - **Low serum high-density lipoprotein**
  - **Elevated serum triglyceride**
- (Metabolic syndrome: three of these five criteria)**

**(Tasali E and Ip MSM. Proc Am Thorac soc 2008; 5: 207-217)**

# CPAP for Metabolic Syndrome

- **In a double-blind placebo-controlled randomised trial, patients were treated for the obstructive sleep apnea syndrome with 3 months of continuous positive airway pressure (CPAP) followed by 3 months of sham CPAP or vice versa with a wash period of one month in between.**

**Sharma SK et al. N Engl J Med 2011; 365: 2277-86**

# Study Overview

**CPAP therapy lowered blood pressure and ameliorated metabolic abnormalities.**

**Sharma SK et al. N Engl J Med 2011;365:2277-2286**