Treatment of Obstructive Sleep Apnea

Choosing the Best Positive Airway Pressure Device

Neil Freedman, MD

KEYWORDS

• CPAP • Bilevel PAP (BPAP) • AutoPAP (APAP) • AutoBPAP • Expiratory pressure relief • Humidification • Adherence

KEY POINTS

- Continuous positive airway pressure (CPAP), autotitrating positive airway pressure (APAP), and bilevel positive airway pressure (BPAP) are all reasonable therapies that can be used for patients with uncomplicated obstructive sleep apnea (OSA) across the spectrum of disease severity.
- All of these therapies can be expected to reduce or resolve sleep-disordered breathing and improve symptoms of daytime sleepiness, with the best outcomes being observed in patients with moderate to severe OSA.
- Unattended APAP, either as chronic treatment or as a method to determine a fixed CPAP setting, should be considered first-line therapy for patients with uncomplicated OSA.
- BPAP should be considered for patients who are nonadherent to CPAP or APAP therapy because of pressure intolerance.
- Other factors that should be considered when choosing a PAP device for a given patient include cost, access to online data management software and patient portals, additional technologies such as heated humidification and expiratory pressure relief, and ease of portability for patients who travel frequently.

INTRODUCTION

Treatment with positive airway pressure (PAP) remains the primary therapy for most patients with obstructive sleep apnea (OSA), especially those with moderate to severe OSA. This article focuses on how to determine which type of PAP device may be best for treating a given patient or patient population with OSA. Initially, the author reviews the various forms of PAP therapy for the treatment of OSA, including continuous positive airway pressure (CPAP), autotitrating positive airway pressure (APAP), and bilevel positive airway pressure (BPAP) therapies, focusing on their mechanisms of action and indications for use in clinical practice. The remainder of the article focuses on how to determine the best PAP device for a given patient or patient population, evaluating factors such as expected outcomes, ease of use and cost of therapy, application of additional technologies, online data management, patient portals and application-based interfaces and compatibility with other manufacturers interfaces and supplies. This review focuses on types of PAP delivery systems and associated technologies and does

Disclosure Statement: The author has nothing to disclose.
Pulmonary, Critical Care, Allergy and Immunology, Department of Medicine, North Shore University Health System, 2650 Ridge Avenue, Evanston, IL 60201, USA
E-mail address: Neilfreedman@comcast.net

Sleep Med Clin ■ (2017) ■–■
http://dx.doi.org/10.1016/j.jsmc.2017.07.003

not make recommendations based on a specific manufacturer because it is not clear from the literature that any one manufacturer's devices are consistently superior. Finally, this article only briefly covers interventions that may improve adherence to therapy and various mask interfaces, because these topics will be covered in depth within their own dedicated articles within this issue.

TYPES OF POSITIVE AIRWAY PRESSURE DEVICES

Once the clinician has determined that PAP therapy is the best choice for a given patient with OSA, they initially need to decide which type of PAP technology to use, because there are several modes in which PAP therapy can be delivered. These modes include CPAP, APAP, BPAP, and Auto-BPAP.

Continuous Positive Airway Pressure

CPAP therapy was initially described as a treatment of OSA by Sullivan and colleagues[1] in 1981. Since its initial description, CPAP has become the predominant therapy for the treatment of patients with OSA, because it has been demonstrated to resolve sleep-disordered breathing events and improve several clinical outcomes.[2,3] CPAP delivers a single pressure to the posterior pharynx throughout the night and acts as a pneumatic splint that maintains the patency of the upper airway in a dose-dependent fashion. The best pressure for CPAP treatment is typically determined during an in-laboratory attended sleep study, although a fixed CPAP pressure may also be determined using a short unattended trial of APAP therapy. Treatment with CPAP is typically indicated for patients with moderate to severe OSA (Apnea Hypopnea Index [AHI] $\geq$15 events per hour) with or without associated symptoms or comorbid diseases, and for patients with mild OSA (AHI $\geq$5 to $\leq$14 events per hour) with associated symptoms or comorbid diseases (**Box 1**).

Box 1
Typical indications for positive airway pressure therapies for obstructive sleep apnea

- CPAP
  - Moderate to severe OSA ($\geq$15 events per hour of sleep) with or without associated symptoms or comorbid diseases
  - Mild OSA ($\geq$5 to $\leq$14 events per hour of sleep) *with* symptoms or associated comorbid diseases:
    - Symptoms:
      - Excessive daytime sleepiness, impaired cognition, mood disorders or insomnia
    - Comorbid diseases:
      - Hypertension, ischemic heart disease, or history of stroke
- APAP
  - Moderate to severe uncomplicated OSA
  - APAP should *not* be used in patients with complicated OSA
    - Complicated OSA is defined as OSA associated with comorbid medical conditions that could potentially affect their respiratory patterns during sleep, including (1) CHF; (2) Lung diseases such as COPD; and (3) Patients expected to have nocturnal arterial oxyhemoglobin desaturation because of conditions other than OSA (eg, obesity hypoventilation syndrome and other hypoventilation syndromes).
  - May be used in an unattended setting for as the exclusive initial and ongoing therapy
  - May also be used as initial therapy to determine a fixed CPAP setting
- Bilevel PAP
  - May be used for the entire spectrum of OSA severity, although is typically considered for patients who have failed CPAP therapy or have pressure intolerance to other initial PAP therapies
- Auto-bilevel PAP
  - Role in OSA therapy and indications not clear

Autotitrating Positive Airway Pressure

APAP (also known as auto-, automated, auto-adjusting, or automatic) incorporates the ability of the PAP device to detect and respond to changes in upper airway flow or resistance in real time.[4] Currently available APAP devices use proprietary algorithms to noninvasively detect and respond to variations in patterns of upper airway inspiratory flow or resistance. Most APAP machines monitor a combination of changes in inspiratory flow patterns, including inspiratory flow limitation, snoring (indirectly measured via mask pressure vibration), reductions of airflow (hypopnea), and absence of flow (apneas), using a pneumotachograph, nasal pressure monitors, or alterations in compressor speed. Another less commonly used technology uses forced oscillation technique (FOT), which is