

Mixed methods of treatment in sleep apnea: Phrenic nerve stimulation combined with positive pressure ventilation

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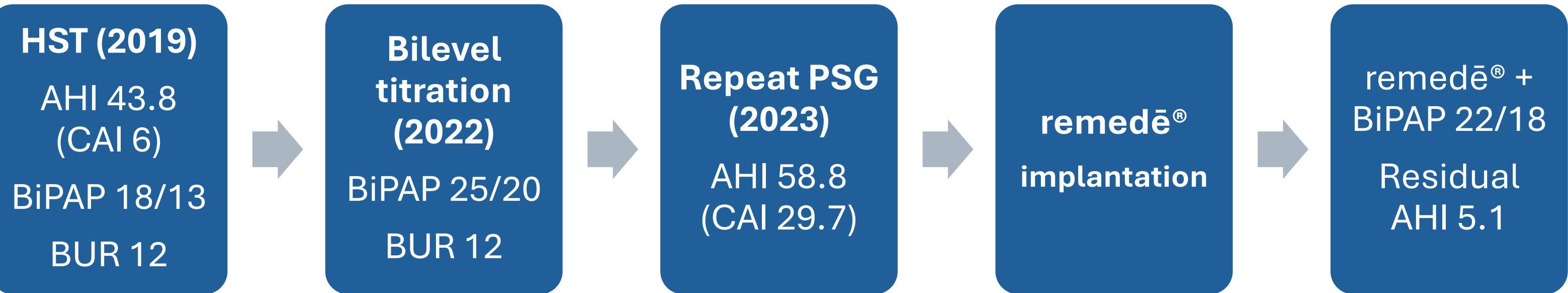
Introduction

Treatment of mixed sleep apnea can be challenging to treat and may occasionally require multiple treatment modalities. We present a case of mixed sleep apnea treated concurrently with a phrenic nerve stimulator and positive airway pressure. The remedē® phrenic nerve stimulator was first described in 2014^{1,2}, with the first randomized control trial published in 2016 showing 51% of the treatment group had an AHI reduction from baseline of 50% or greater at 6 months than those in the control group³.

Case Description

A 60 year old patient with a past medical history of hypertension was seen in sleep clinic due to snoring, poor quality sleep, and excessive daytime sleepiness. He was diagnosed with mixed sleep apnea. His home sleep study revealed a respiratory event index of 43.8 with a central index of 6. A CPAP titration study led to increased treatment emergent sleep apnea and Cheyne Stokes breathing pattern, requiring BiPAP 18/13 with a backup rate of 12. Due to persistently high residual AHI despite excellent use, his BiPAP settings were titrated to 25/20 with a backup rate of 12. He was unable to tolerate these higher settings. A repeat PSG 2 showed an apnea/hypnea index (AHI) of 58, of which 50% was central apneas. He underwent placement of a phrenic nerve stimulator (Remede©) allowing for reduced positive airway pressure settings and significantly improved tolerance, improved symptoms and residual AHI.

Case Timeline



remedē® settings

Battery Voltage	2.92V
Pulse width	60 μs
Frequency	40Hz
Supine Amp	2.6 mA
Left Amp	2.8 mA
Prone Amp	2.8 mA
Right Amp	2.6 mA
Max. Supine Amp	3.2 mA
Max. Left Amp	3.5 mA
Max. Prone Amp	3.5 mA
Max. Right Amp	3.2 mA
Suspension Window:	1.5 m
Minimum Lead Impedance	200 Ohm
Maximum Lead Impedance	2500 Ohm

Discussion

Central sleep apnea (CSA) may be related to medical conditions such as heart failure with reduced ejection fraction, stroke or medication use such as opiates, and may exist concurrently with obstructive sleep apnea. Phrenic nerve stimulation is a novel treatment option which may be considered for patients with mixed sleep apnea to both treat CSA and improve tolerance of alternative treatment options.

References

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