



Patient Information

Adaptive Servo Ventilation (ASV)

What is adaptive servo-ventilation (ASV)? ASV is an exciting breakthrough created specifically for the treatment of central and obstructive apnea.

How does ASV work?

-ASV is a new form of positive airway pressure that continuously monitors and analyzes the patient's breathing pattern.

-When the ASV unit detects significant reductions or pauses in breathing, it intervenes with just enough support to maintain the patient's breathing at 90% of what had been normal for that individual just prior to the decrease in breathing.

-Then, when normal spontaneous respiration resumes, the machine "backs out" gently.

-When the patient's breathing is stable, ASV provides just enough pressure support to help maintain airway patency, providing an approximate 50% reduction in the work of breathing.

The machine is subtle in its interventions and it continuously adjusts itself to meet the patient's needs in a manner that will feel normal for that patient at that point in time, resulting in a marked increase in comfort.

ASV is the ultimate "smart machine".

How does ASV differ from the positive airway pressure machines that were already available?

-Until the development of ASV, we had only three basic types of positive airway pressure (PAP) machines:

- CPAP (Continuous Positive Airway Pressure): a simple "blower" that delivers the same pre-set pressure continuously.
- Bilevel PAP: a machine that senses when the patient is beginning to exhale and responds

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- by dropping the delivered pressure transiently to render exhalation easier.
- Bilevel PAP with intermittent mandatory ventilation (IMV): a bilevel unit that also senses when the patient stopped breathing--then responding by delivering bursts of air at pre-set pressures and a pre-set rate to try to stimulate breathing. Its greatest disadvantage was that it would force the patient to try to adapt to the machine rather than the machine adapting to the patient's rate and depth of breathing. Many patients complain that they are unable to synchronize their breathing with these machines. Also, the abruptness with which these units deliver IMV can trigger transient arousals which in turn can precipitate more central apneas.

-ASV is unique in that it continuously adapts to the patient. It provides just enough support when the patient needs it...in a manner so similar to the patient's own recent breathing pattern and rate that it is not only comfortable, but it is unlikely to provoke arousals and more central apneas.

Which patients with central sleep apneas are most likely to benefit from ASV?

-Patients with complex sleep apnea (central apneas emerging with treatment of obstructive apneas with CPAP or bilevel PAP).

-Patients with heart failure or atrial fibrillation who have central sleep apnea - with or without obstructive sleep apneas.

-Chronic pain patients with narcotic-induced central or complex apnea.

How much more effective is ASV in these patients, when compared to the alternatives?

-A study compared the effectiveness of ASV, CPAP, bilevel PAP with IMV and oxygen in patients with heart failure. Here are the results:

	NO TREATMENT	OXYGEN	CPAP	BILEVEL WITH IMV	ASV
Apneas and hypopneas per hour of sleep	44.5	28.2	26.8	14.8	6.3
Arousals per hour of sleep	66.7	31.7	32.0	18.4	16.6
% of sleep time spent in REM sleep	12.0	12.7	10.5	16.0	17.8
% of sleep time spent in deep, slow wave sleep	13.9	18.4	16.6	21.1	24.9

*Teschler H et. al. Adaptive Pressure Support Servo-Ventilation. A Novel Treatment for Cheyne-Stokes Respiration in Heart Failure. Am J Resp & Crit Care Med 16: 614-619, 2001

-Only ASV reduced the number of episodes of apnea and hypopnea to normal, and ASV clearly was superior at reducing sleep fragmentation and increasing vital stages of sleep needed for proper rest. All patients preferred ASV to CPAP.

Since ASV adjusts to the patient, are overnight sleep studies needed for titration before treatment with ASV is prescribed?

-Yes, for two important reasons:

- There are three parameters of ASV that must be adjusted to the individual patient's needs: the end-expiratory pressure and both the minimal and maximal pressure support settings. As with positive airway pressure in general, these devices must be set just right for the patient or the end result will be much like buying the wrong size shoes. We believe strongly in precise titrations, since problems with positive airway pressure treatment are similar to a piece of gravel on one's shoes: the size of the piece of gravel doesn't matter. If everything is not just right, the patient will be likely to abandon treatment.
- Insurance companies and Medicare typically require proof that a treatment is effective before they will pay for it.

-Therefore, if you or a loved one suffers from indications of central sleep apneas--whether from use of CPAP/bilevel PAP for obstructive sleep apnea or as a complication of heart disease or other medical condition, it is important that you select an accredited sleep center that has ASV machines on site, as well as physicians and technicians with training and experience in the use of ASV.