The International Franco - Palestinian Congress in Sleep Medicine

“Temporomandibular Disorders and Sleep Apnea”

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Advanced Positive Airway Pressure Titrations

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Obstructive apnea

Respiratory effort exists. No flow for a minimum of 10 seconds

Obstructed airways

Central apnea

No respiratory effort. No flow for a minimum of 10 seconds.

Normal unobstructed airway
Cheyne-Stokes Respiration

Waxing and waning respiratory efforts
The prevalence is even higher in those suffering from cardiovascular diseases:

- **Pulmonary Arterial HT**: 71% (Minci et al., JCSM 2014)
- **Resistant HT**: 70% (Martinez-Garcia et al., JAMA 2013)
- **Stroke**: 60% (Bassetti et al., Sleep 1999)
- **Heart Failure**: 53% (Kasai et al., JACC 2011)
- **Hypertension**: 45% (Nieto et al., JAMA 2000)
- **Coronary Insufficiency**: 30% (Schafer et al., Cardiology 1999)
autoSV therapy

BiPAP autoSV is a servo-ventilation device designed to treat:

**Central Sleep Apnea**
- Idiopathic
- Opioid-induced

**Complex Sleep Apnea**
- CompSAS (or CPAP-emergent)

**Periodic Breathing**
- Cheyne-Stokes Respiration
Why not use BiLevel Therapy with these patients?

Exaggerated Tidal Volumes
Using BiLevel Therapy with Cheyne-Stokes Patients

- Worse CSR with BiPAP is more common among patients with baseline CSR.

- Patients who start with an unstable respiratory system are particularly prone to become more unstable during BiPAP

Johnson KG et al. Chest. 2005
Servo Ventilation Therapy can stabilize the breathing pattern.
Servo Ventilation Algorithm

On a breath by breath basis peak flow is captured
Peak flow is monitored over a moving 4 minute window
As 1 breath is added, the initial breath falls off
At every point within this 4 minute period an *Average Peak Flow* is calculated
The *Peak flow target* is established around that average and is based on the patient’s needs
Servo ventilation algorithm – normal breathing

IF: Peak flow is at target
THEN: autoSV Advanced delivers CPAP pressure
Servo ventilation algorithm – decreased flow
Breaking Down the aSV Algorithm

- Obstructive events
- Unstable breathing or complex breathing e.g. CSR
- Absence of flow

Auto EPAP

EPAP Min
EPAP Max
You are setting the ranges, not the actual delivered pressure.

The device sets the delivered pressure within the range allowed. It is possible for you to limit the target, but not to directly change the target.
Breaking Down the autoSV Algorithm

- Obstructive events
- Unstable breathing or complex breathing e.g. CSR
- Absence of flow

EPAP Min
EPAP Max

Max Pr

PS Min
PS Max

Rate
Why should you **NOT** use auto Servo ventilation for a neuromuscular diseased patient?

- Would continually reset it is baseline, worsening the hypoventilation
- Normal target continues to decrease – continues to under ventilate patient as the night progresses
Suggested titration Protocol for BiPAP AVAPS

Set Tidal Volume target
Set IPAPmin at 8 cm H₂O
Set IPAPmax at 25 cm H₂O
Set EPAP at 4 cm H₂O
Set Rate at 8-10 BPM or 2 BPM below the patient’s spontaneous rate
Set I-Time at 1.5 seconds or patient comfort
Set Rise time at 2 or 3 or patient comfort

Observe for Events

Obstructive Events
- Increase EPAP by 1 cm H₂O

Respiratory Events
- Inadequate Tidal Volume – Increase the Tidal Volume target
- Inadequate Respiratory Rate – Increase RR by 2 BPM
- Inadequate Oxygenation – Increase EPAP
- Wait 5 minutes

Optimal Pressure Reached
Bi-level with volume assurance is **NOT recommended** for patients with periodic breathing

- Treatment of periodic breathing requires a variable breath-by-breath response system so the patients PaCO$_2$ stabilizes quickly
  - Prevents overshooting or undershooting the PaCO$_2$ breath by breath
  - Does not augment the patients tidal volume consistently

- It does not have a quick variable response to changes in tidal volume
  - It is designed to adjust and maintain a constant tidal volume with each breath over time
  - This benefit often seen with patients who have slow declines in their ventilatory conditions
Summary

• Sleep Disordered Breathing is associated with
  • Cardiovascular diseases (CVD)
  • Obesity hypoventilation syndrome (OHS)

• CVD and OHS patients may present different respiratory events from “simple” OSA

• Servo Ventilation is the treatment modality for periodic breathing seen in patients with CVD

• Volume assured is the treatment modality for hypoventilation such as OHS
Questions?