

Efficacy of BiPAP AutoSV Advanced in Subjects with Congestive Heart Failure and Central Apnea

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Background

- Cheyne-Stokes respiration (CSR) is characterized by periodic sleep disordered breathing (SDB) seen in approximately 40% of congestive heart failure (CHF) patients and is an independent risk factor for death.
- Auto-Servo Ventilation is a mode of pressure support to treat obstructive, central and complex breathing patterns during sleep all of which may be seen in patients with CHF.
- This study compared the efficacy of a new mode of ASV that incorporates an automatic EPAP (ASV-Advanced), with and without pressure relief (Bi-Flex), to manually titrated ASV (ASV) in central SDB and congestive heart failure.

Methods

- Inclusion criteria: Age ≥ 40 – ≤ 80 y, Baseline AHI >15 /h and $>50\%$ central breathing disturbances, LVEF $\leq 40\%$.
- 16 males participated (mean \pm SD: age 67.9 ± 10.9 y, BMI 28.5 ± 4.8 kg/m², LVEF 28.6 ± 6.3 %). 1 Drop-out after diagnosis.
- Following diagnostic polysomnography and EPAP titration, patients underwent 3 consecutive treatment nights in a random order: ASV, ASV-Advanced and ASV-Advanced with Bi-Flex.
- For the ASV night, EPAP was set to the level determined during the titration night and IPAP set at EPAP + 20 cmH₂O.
- For the ASV-Advanced nights, the device was set to automatically determine EPAP and IPAP pressures with a maximum pressure support of 20 cmH₂O. When activated, Bi-Flex was set to its maximum expiratory pressure relief.
- Comparisons between the three treatment groups were done using ANOVA and Bonferroni. Differences to baseline were analysed using paired t-tests, significance level at 0.05.

Results

- At baseline, 77% of breathing disturbances were central.
- All treatment modes significantly improved most types of respiratory disturbances and arousals (Tab. 1).
- ASV-Advanced with and without Bi-Flex nearly abolished Cheyne-Stokes respiration (Fig. 2).
- ASV-Advanced with and without Bi-Flex showed a trend toward better improvement of respiratory parameters (Tab.1).
- With ASV-Advanced + Bi-Flex the proportion of REM increased while N1 decreased compared to baseline (Tab.2).

Conclusions

- ASV-Advanced treats central SDB as effectively as ASV in patients with CHF and is by trend superior.

Tab. 1: Baseline vs. treatment with three different ASV modes. (*p<0.05, **p<0.01, *** p<0.001). Values are given as mean \pm SD.

	Baseline	ASV-Advanced +Bi-Flex	ASV-Advanced	ASV
AHI (/h)	40.0 \pm 12.9	7.2 \pm 6.4***	6.9 \pm 7.9***	11.0 \pm 12.2***
AHI REM (/h)	20.6 \pm 19.4	6.0 \pm 11.6*	4.2 \pm 9.0*	5.6 \pm 10.1*
AHI NREM (/h)	42.6 \pm 13.0	7.5 \pm 6.2***	7.7 \pm 8.4***	12.2 \pm 13.9***
CAHI (/h)	30.7 \pm 14.4	4.5 \pm 4.0***	5.3 \pm 6.1***	8.4 \pm 9.6***
CAI (/h)	15.8 \pm 13.9	0.4 \pm 0.8**	0.6 \pm 1.1**	2.9 \pm 5.0**
HI (/h)	16.6 \pm 9.8	6.5 \pm 5.9**	5.7 \pm 6.7**	7.0 \pm 8.0*
CSRI (/h)	22.3 \pm 15.7	0.6 \pm 2.2***	1.8 \pm 3.1***	4.2 \pm 7.3**
RAI (/h)	18.9 \pm 10.5	3.6 \pm 5.1***	3.8 \pm 5.3***	4.9 \pm 6.5***

AHI: apnea hypopnea index. CAH: central apnea hypopnea index. CAI: central apnea index. HI: hypopnea index. CSRI: Cheyne-Stokes respiration index. RAI: respiratory arousal index

Tab. 2: Sleep structure, baseline and with three different ASV modes. (*p<0.05 vs. baseline). Values are given as mean \pm SD.

	Baseline	ASV-Advanced +Bi-Flex	ASV-Advanced	ASV
TST (min)	278.5 \pm 49.0	263.9 \pm 44.6*	264.3 \pm 54.8	260.3 \pm 65.5
Efficiency (%)	68.6 \pm 11.0	65.9 \pm 11.5	64.3 \pm 12.0	63.9 \pm 13.5
N1 (%TST)	26.6 \pm 13.8	17.5 \pm 10.1	23.5 \pm 15.9	20.7 \pm 11.3
N2 (%TST)	39.5 \pm 14.8	43.0 \pm 9.8	38.9 \pm 13.2	42.8 \pm 13.1
N3 (%TST)	22.0 \pm 11.6	20.3 \pm 13.1	19.3 \pm 11.6	19.4 \pm 14.7
REM (%TST)	11.9 \pm 6.1	19.3 \pm 7.9*	18.3 \pm 11.3*	17.2 \pm 8.3*

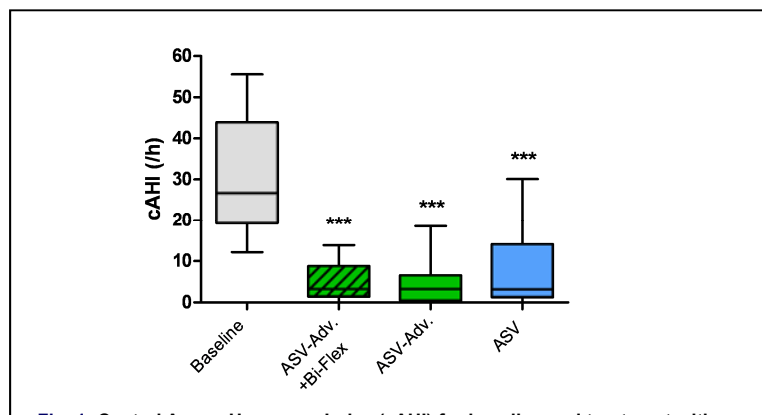


Fig. 1: Central Apnea-Hypopnea Index (cAHI) for baseline and treatment with three different ASV modes. (Whiskers: min to max., ***p<0.001 vs. baseline)

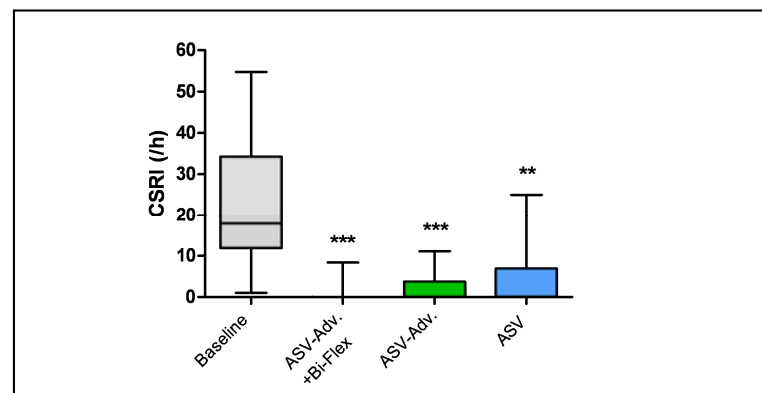


Fig. 2: Cheyne-Stokes respiration index (CSRI) for baseline and treatment with three different ASV modes. (Whiskers: min. to max., ***p<0.001, **p<0.01 vs. baseline)