

Treatment Adherence and Outcomes in Flexible versus Standard Continuous Positive Airway Pressure



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Introduction

Background

- Obstructive sleep apnea (OSA) is associated with neuropsychological and cardiovascular sequelae.
- Continuous Positive Airway Pressure (CPAP) improves daytime functioning, quality of life and blood pressure.
- Despite its reported efficacy, nightly adherence to CPAP is suboptimal.
- Technological advances in airflow delivery such as Auto-titrating CPAP and Bi-level airway pressure devices aim to improve patient adherence, comfort, and effectiveness for reducing inspiratory flow limitation.
- These advances have been variably effective for improving treatment adherence compared to CPAP.
- **C-Flex™ is a recent technologic advance in which airway pressure is reduced during early exhalation and then increased at end-exhalation on a breath-by-breath basis (Fig. 1)**
- In theory C-Flex™ is associated with similar efficacy but increased comfort during exhalation and may improve adherence compared to conventional CPAP.

Objective

- **To compare C-Flex™ and traditional CPAP on adherence, treatment outcomes and attitudes toward treatment of OSA.**

Methods

Study Population/Procedures

- 89 participants (64 men 24 women, ages 25-80 yrs) with OSA were recruited prior to starting CPAP.
- OSA was diagnosed by full in-lab overnight polysomnography and adequate CPAP settings, (defined by the absence of apneas/hypopneas and snoring), were determined on a separate full night titration study.
- All participants were referred to the same home healthcare company.
- All CPAP devices (REMstar® Pro) were equipped with objective monitors of CPAP use and heated humidification.
- **Participants enrolled 4/2002-4/2003 (n = 41) received conventional CPAP machines; those from 4/2003 -3/2004 (n = 48) received CPAP machines with C-Flex™ technology.**

Measurements

Adherence

- Monitored with SmartCard™ technology.
- Reported as the total number of hours used at the prescribed pressure per 24-hour period.
- Data are collected at week 1, week 2-4, week 6-8 and week 9-12 after starting on CPAP or C-Flex.

PSG Variables

- Apnea- hypopnea index
- Time spent below SaO₂ of 90% (min.)

Treatment Outcomes

- Epworth Sleepiness Scale
- Functional Outcomes of Sleep Questionnaire (FOSQ)
- Self-Efficacy Scale - Measures patient's confidence about his/her ability to use CPAP even under difficult circumstances (a higher score indicates greater confidence for use).

Analysis

- Adherence data and clinical outcomes for the CPAP vs. C-Flex groups were compared over time with a repeated measures ANOVA and Bonferroni post-hoc test.
- Spearman rank correlation to examine predictive utility of self-efficacy on adherence.

Results

- Groups were not different on demographic or severity measures.
- Adherence over the 3 month follow up was higher in the C-Flex™ compared to the CPAP group (2-4 weeks: 4.2 ± 2.4 vs 3.5 ± 2.8 hours and at 9-12 weeks: 4.8 ± 2.4 vs 3.1 ± 2.8, p 0.003). Self-efficacy scores trended higher at follow-up in those treated with C-Flex™ compared to CPAP.

Demographics & OSA Severity

Variable	CPAP	C-Flex™
Age	51.4 (10.8)	53.7 (11.0)
Education	14.4 (2.4)	14.7 (3.4)
AHI	39.4 (25.9)	43.2 (22.7)
SA90	79.3 (99.2)	60.4 (79.6)
CPAP Pressure	9.8 (2.9)	10.1 (2.0)
BMI	31.7 (5.2)	32.0 (3.7)
Epworth (/24)	11.2 (4.8)	10.7 (4.7)
Self-efficacy (/25)	19.9 (3.3)	20.4 (3.1)

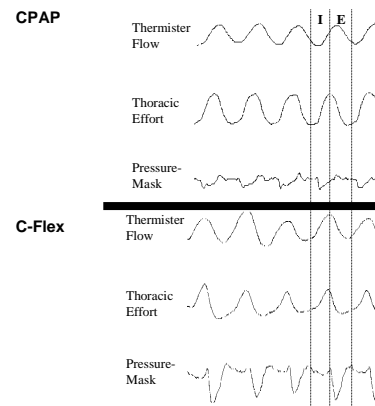
* Statistically significant at the p < .05 level

Outcome Measures for the Groups

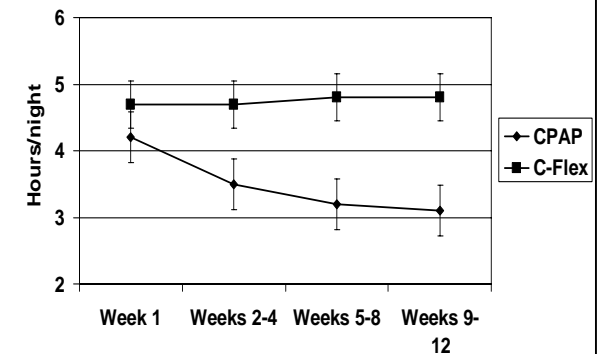
Variable	CPAP		C-Flex™		p*
	Baseline	3 month	Baseline	3 month	
Epworth	11.2 (4.8)	9.4 (4.6)	10.7 (4.7)	8.3 (3.9)	0.56
FOSQ Total	9.9 (2.8)	8.0 (2.0)	9.6 (2.7)	7.7 (2.2)	0.99
Self-Efficacy	19.9 (3.3)	19.6 (5.4)	20.4 (3.1)	21.9 (3.4)	0.06

* p value for the change over time of variables by group

Figure 1. Raw Data from 1 subject: CPAP vs C-Flex



Average Nightly CPAP Use over time by Group



Contact Information

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Conclusions

- C-Flex™ may improve overall adherence over three months compared to standard CPAP.
- Clinical outcomes do not improve consistently, but C-Flex™ users may be more confident about their ability to adhere to treatment.
- Randomized clinical trials are needed to replicate these findings.