Can CPAP prevent myocardial damage?

Continuous Positive Airway Pressure has been pointed as gold standard treatment for obstructive sleep apnea (OSA) since 1980s. Several beneficial effects have been reported, in particular with regard to sleepiness, apnea hypopnea index or nocturnal hypoxemia (1). However, the cardiovascular consequences of OSA have been better explored in the last decade. Perhaps the most important mechanisms contributing to myocardial damage are: endothelial dysfunction, increased sympathetic activity, inflammation and metabolic anomalies (2). As a result left ventricle (LV) and right ventricle (RV) dysfunction have been reported in patients with moderate to severe OSA (2, 3). With regard to cardiac function, several studies addressed the effects of CPAP in heart failure patients. Jardin F et al. (4) in 1984 evaluated the acute effect of CPAP using M-mode ecocardiographic evaluation, and found a marked decrease in left and an increase in right ventricular dimensions during both expiration and inspiration and a significant decrease in calculated stroke output. However, the long-term effect of CPAP treatment on cardiac function and structure may be beneficial, but clinical trials, randomized studies including significant number of patients and significant follow up period are scant. In this context, the study of Bilge et al. (5) in this issue published in the Anatolian Journal of Cardiology adds to the literature because the authors evaluated the cardiac function of OSA patients after 5-year of CPAP effective treatment. Butt et al. (6) found a reduction of the posterior wall thickness, improvement in LV ejection fraction (EF), systolic S velocity, and diastolic LV parameters after a mean of 26 weeks of CPAP treatment. Grandi et al. (7) evaluated overweight and obese patients. They also performed echocardiographic evaluation before and after 18 months of CPAP treatment, and found LV remodeling is not associated with OSA per se, but it was mainly linked with body weight decrease (7). Colish et al. (8) using both echocardiogram and cardiac MRI found that systolic and diastolic abnormalities improved with 3 months of CPAP, but cardiac remodeling improved after one year of treatment, reinforcing the importance of long term studies for the evaluation of cardiac functional and structural parameters in OSA patients. In summary some studies have shown differential improvement in LV and RV function after 6 months of CPAP treatment in OSA patients without heart failure (3, 9-11). The studies of our group reinforced the improvement in LV and RV function after 6 months of CPAP, especially in those patients with severe OSA who showed higher frequency of LV and RV impairment (3, 11). Strengths of Bilge et al. (5) study are related to the design: a) prospective cohort study; b) compliance to treatment of at least 5 hours daily; c) long term follow up of 5 years; d) exclusion of uncontrolled high blood pressure. The authors were also careful when reporting LV and RV variables using echocardiography and Doppler techniques. However, they ended up with 21 patients which mean nearly half initial number, which may be in agreement with other studies showing similar rate of CPAP compliance. Their patients did not show significant impairment on echocardiographic and tissue Doppler parameters at baseline, but, still, the authors were able to show improvement in the classical Doppler parameters. However, the only tissue Doppler parameter that differed significantly after 5-year CPAP treatment was the early diastolic myocardial peak velocity/ Late diastolic myocardial peak velocity (Em/Am) ratio. Finally the authors concluded that echocardiographic monitoring with Doppler may be useful to monitor CPAP efficacy. To fully respond to the question of "Can CPAP prevent myocardial damage, independently of hypertension" is still a matter of discussion, and future larger controlled and randomized trials are still needed.

Dalva Poyares[1], Wercules Oliveira[1,2], Luciane Fujita[1]
[1]Department of Psychobiology, Sleep Medicine and Biology Division, Universidade Federal de; São Paulo-*Brazil*
[2]Division of Cardiology, Universidade Federal de; Sao Paulo-*Brazil*

References

1. Gay P, Weaver T, Loube D, Iber C. Evaluation of positive airway pressure treatment for sleep related breathing disorders in adults. A Review by the Positive Airway Pressure Task Force of the Standards of Practice Committee of the American Academy of Sleep Medicine. Sleep 2006; 29: 381-401.
2. Baguet JP, Barone-Rochette G, Tamisier R, Levy P, Pépin JL. Mechanisms of cardiac dysfunction in obstructive sleep apnea. Nat Rev Cardiol 2012; 9: 679-88. [CrossRef]
3. Oliveira W, Poyares D, Cintra F, Vieira ML, Fischer CH, Moises V, et al. Impact of continuous positive airway pressure treatment on right ventricle performance in patients with obstructive sleep apnoea, assessed by three-dimensional echocardiography. Sleep Med 2012; 13: 510-6. [CrossRef]
4. Jardin F, Farcot JC, Guéret P, Prost JF, Ozier Y, Bourdarias JP. Echocardiographic evaluation of ventricles during continuous positive airway pressure breathing. J Appl Physiol Respir Environ Exerc Physiol 1984; 56: 619-27.
5. Bilge AR, Yavuz V, Kum G, Yılmaz H, Çetin N, Dalgıç O, et al. The effect of long term continuous positive airway pressure treatment

Address for Correspondence: Dr. Dalva Poyares MD phD, Department of Psychobiology, Sleep Division Universidade, Federal de; Sao Paulo-*Brazil*
Phone: 55-11-985937418 Fax: 55-11-55725092 E-mail: poyares@unifesp.br

Accepted Date: 21.02.2014 **Available Online Date:** 19.03.2014

DOI:10.5152/akd.2014.1288932

on systolic and diastolic function in patients with obstructive sleep apnoea syndrome: a 5 year observational study. Anadolu Kardiyol Derg 2014; 14: 00-00.

6. Butt M, Dwivedi G, Shantsila A, Khair OA, Lip GY. Left ventricular systolic and diastolic function in obstructive sleep apnea: impact of continuous positive airway pressure therapy. Circ Heart Fail 2012; 5: 226-33. [CrossRef]
7. Grandi AM, Laurita E, Marchesi C, Maresca AM, Solbiati F, Bernasconi A, et al. OSA, metabolic syndrome and CPAP: effect on cardiac remodeling in subjects with abdominal obesity. Respir Med 2012; 106: 145-52. [CrossRef]
8. Colish J, Walker JR, Elmayergi N, Almutairi S, Alharbi F, Lytwyn M, et al. Obstructive sleep apnea: effects of continuous positive airway pressure on cardiac remodeling as assessed by cardiac biomarkers, echocardiography, and cardiac MRI. Chest 2012; 141: 674-81. [CrossRef]
9. Akar Bayram N, Çiftçi B, Durmaz T, Keleş T, Yeter E, Akçay M, et al. Effects of continuous positive airway pressure therapy on left ventricular function assessed by tissue Doppler imaging in patients with obstructive sleep apnoea syndrome. Eur J Echocardiogr 2009; 10: 376-82. [CrossRef]
10. Bayram NA, Çiftçi B, Bayram H, Keleş T, Durmaz T, Akçay M, et al. Effects of continuous positive airway pressure therapy on right ventricular function assessment by tissue Doppler imaging in patients with obstructive sleep apnea syndrome. Echocardiography 2008; 25: 1071-8.
11. Oliveira W, Campos O, Cintra F, Matos L, Vieira ML, Rollim B, et al. Impact of continuous positive airway pressure treatment on left atrial volume and function in patients with obstructive sleep apnoea assessed by real-time three-dimensional echocardiography. Heart 2009; 95: 1872-8. [CrossRef]