

Effect of yoga regimen on lung functions including diffusion capacity in coronary artery disease patients

This paper presents the results from a randomized controlled trial (RCT) that evaluated the effect of a 3 month yoga regimen on pulmonary functions and diffusion factor of the lung for carbon monoxide (DLCO) in patients with stable coronary artery disease (CAD) on conventional treatment. Patients with CAD have compromised pulmonary functions, generally associated with stress and anxiety. Role of neuro-hormonal modulators and cytokines has been outlined in disease characteristics and pathophysiology of pulmonary dysfunction. Treatment is mostly symptomatic, and, therefore, it is important to address the causal factors in CAD. Since yoga, especially *pranayama*, is shown to be efficacious in improving the pulmonary functions in patients with respiratory diseases, it may be beneficial in patients with CAD also.^[1-3] The results from the present study bring forth clinically important finding, where patients with CAD showed a significant improvement in the pulmonary functions and DLCO following a 3 month yoga regimen versus the control group. Since, this is the first study of its kind, it is important to appraise this study critically with respect to its strengths and limitations, and possibly future directions.

In this assessor-blind RCT, patients with stable CAD received either conventional treatment alone ($n = 40$, control group) or conventional treatment along with a yoga regimen for a period of 3 months ($n = 40$). The trial design appears to be adequate, and the study groups appropriately chosen. However, the study design did not include either a subgroup analysis or stratified randomization based on gender, which becomes the major limitation of the study. It is well-known that the pulmonary functions vary largely with gender, which was not accounted for in this study. The yoga regimen included *pranayama*, diet modulation, and holistic teaching. The duration of intervention appears adequate. However, it is not clear whether patients modified their diet or not as advised by a dietician. This is an important aspect of triggering or preventing any allergen-induced bronchial spasm.^[4] Further, weight-loss and change in body mass index was not evaluated in this study as obesity also affects pulmonary function.^[5] As concomitant therapy, patients received conventional therapy including angiotensin converting enzyme inhibitors or calcium channel blockers with aspirin. Since aspirin is likely to have an anti-inflammatory action,^[6] which might bias the results if the distribution of these patients in two arms was unequal, could have been

statistically evaluated. The assessments were done by a blinded assessor, which is the strength of the study. The assessments included pulmonary function tests (PFT), and DLCO at Baseline, day 22, and day 90 along with heart rate, and blood pressure assessment at Baseline and day 90. One of the key strengths of the study is that DLCO was evaluated for the first time in patients with stable CAD, and receiving the yogic intervention in an RCT. However, to my understanding one of the major limitations of the study was that the markers of stress and inflammation were not evaluated, which could have also thrown some light on the mechanism of the benefits observed in this study. This would have added to the strength of the study as yoga has been shown to reduce stress, inflammation,^[7] and anxiety^[8] which are the common causal factors for pulmonary dysfunction. The correlation of improvement in PFT, and DLCO with markers of stress, inflammation and anxiety would have given more strength to the findings, and also wider acceptability. Interestingly, none of the patients dropped out of the study despite the fact that study was for 3 months, indicating a good compliance. Overall, the study had several strengths and a few limitations, which can be addressed and overcome in future studies, and provide robust data for efficacy of a yoga-based regimen in improving pulmonary function in patients with stable CAD.

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