



## Effect Of Threshold Inspiratory Muscle Training On Pulmonary Functions In Patients Undergoing Coronary Artery Bypass Graft Surgery

CONTROL ID: 2341137

**AUTHORS/INSTITUTIONS:** A. Elmarakby, Doctor of Physical Therapy Program, Utica College, Utica, New York,

**Purpose/Hypothesis :** The purpose of the study was to objectively investigate the changes in the maximal inspiratory pressure (MIP), blood oxygen saturation (SpO<sub>2</sub>), and alveolar to arterial gradient (A-a gradient) after application of IMT in patients undergoing CABG.

**Number of Subjects :** 33 male patients undergoing CABG were randomly assigned into intervention group (17 patients, 56.90 ± 3.75 years) and control group (16 patients, 56.95 ± 3.75 years ).

**Materials/Methods :** Groups received the usual physical therapy care before and after surgery; however, intervention group received pre and postoperative inspiratory muscle training (IMT) using an inspiratory threshold-loading device (Powerbreathe Wellness Plus, Gaiam Ltd, Warwickshire, UK) for 15 minutes twice daily (Dronkers et al. 2008). During the ICU period and after extubation, the intervention group was encouraged to complete 30 breaths as deeply and as forcefully as they could (Westerdahl et al., 2003), twice daily and the threshold load was adjusted at 30 % of their MIP (Saad et al., 2014). The resistance was increased incrementally, based on the rate of perceived exertion (RPE) scored by the patient on the Borg CR-10 Scale (Morishita et al., 2013). MIP was measured by using Micro Respiratory Pressure Meter (Micro RPM) from Micro Medical Ltd. Oxygen saturation (SpO<sub>2</sub>) was measured by pulse oximetry (Oxypal, Nihon Kohde). Alveolar to arterial gradient was recorded using the A-a gradient = PA O<sub>2</sub> - PaO<sub>2</sub> before undergoing surgery, immediately after surgery and after 8, 16, 24, 32, and 40 hours in the intensive care unit. This time interval was taken to be chronologically parallel with the arterial blood gas (ABG) routine of the intensive care unit.

**Results :** Before discharge from the hospital, the MIP in the intervention group was

significantly higher than the MIP in the control group ( $p=0.001$ ). Also, a highly significant difference was noticed between the mean values of SpO<sub>2</sub> of the intervention and control groups ( $p < 0.0001$ ). It was noticed that, there was a moderate positive correlation ( $r =0.47$ ,  $p= 0.03$ ) between the change in MIP values and the change in SpO<sub>2</sub> values before discharge. The mean value of A-a gradient immediately after surgery and after 40 hours in the intervention group was lower than that in the control group ( $0.0001$ ). Such improvement in the performance of experimental group can be attributed to the effect of inspiratory muscle training received pre and post operatively.

**Conclusions** : instrumented diaphragmatic muscle strengthening in patients undergoing coronary revascularization caused an increase in MIP, and an improvement in SpO<sub>2</sub>. IMT, also, caused a decrease in A-a gradient reflecting improvement in gas exchange and the pulmonary function.

**Clinical Relevance** : It is recommended to add the threshold load IMT to the physical therapy program applied to patients undergoing coronary revascularization to improve the respiratory muscle strength and reduce postoperative atelectasis and pulmonary complications