

Efficacy of Ancillary Cardiopulmonary Therapeutic Regimen on Tissue Perfusion, Post-operative Pain, and Pulmonary Functions During Acute Phase I of Cardiopulmonary Rehabilitation Following CABG Surgery: A Pilot study

Omprakash Palanivel, Ph.D* .Dr Ali Al Bshabshe, MD** Senthil Purushothaman, Ph.D* Sanjay Theodore, Mch*** Sivakumar Ramakrishnan, MD**** Mohammed Bahis Alshahrani, MD***** Ali Abdullah Kablan, MD*****Nasser Mohammed Alwadai RRT***** Khalid Ahmed Ali Khormi, RRT **** Alamri Saeed Saad Saeed SAT***** Sathish Kumar Sadagobane M.P.T***** Elanchezhian Chinnavan, PhD***** Sudha Subramani PhD***

ABSTRACT

Background: Impaired tissue perfusion, postoperative pain discomfort, and postoperative pulmonary complications are all significant concerns that arise immediately after coronary artery bypass grafting (CABG).

Aim: This is a prospective pilot study that investigated the effects of prophylactic Non-Invasive Positive Pressure Ventilation (NIPPV) on tissue perfusion and the effect of Transcutaneous Electrical Nerve Stimulation (TENS) as combined ancillary therapy on acute postoperative pain at coughing and pulmonary functions in participants who underwent off-pump CABG surgery with good left ventricular function or mild left ventricular dysfunction.

Methods: This pilot study involved 40 participants, randomly divided into two groups: an intervention group (n = 20) receiving NIPPV (2 sessions) and TENS (6 sessions), and a control group (n = 20) receiving standard routine care. We assessed the tissue perfusion effect on each group using blood lactate and mixed central venous oxygenation (ScvO₂) levels. We measured the effect of pain on each group using a Numerical Pain Rating Scale (NPRS) and measured lung function using spirometry.

Results: There are statically significant difference in post operative pain at coughing, tissue perfusion, pulmonary functions and length of intensive care stay (p<0.001). Compared to the control group (mean difference of ScvO₂ and blood lactate at baseline, 1st hour, 8th hour and post 30 minutes of 8th hour were 59.3±3.294, 57.4±2.873, 57.3±3.556, 57.35±3.453 and 2.48±0.2308, 2.445±0.2417, 2.105 ±0.3649, 2.105±0.3649), NIPPV greatly increased blood flow to tissues (mean difference of ScvO₂ and blood lactate at baseline, post 1st hour, 8th hour and post 30 minutes of 8th hour were 59.1±3.946, 64.1±5.16, 67±4.484, 66.9±4.229, p<0.001 and 2.51±0.3024, 2.095±0.2837, 1.705±0.2089, 1.705±0.2089, p<0.001). TENS greatly decreased pain at coughing (mean difference at day 0, 1st, 2nd and 5th postoperative day were 9.0500±.223, 6.25±1.25132, 4.8±1.15166, 4.4±0.50262 and enhanced the pulmonary function in the intervention group (p<0.001). Also, the intervention group showed a lower incidence of impaired respiratory events and shorter duration's of postoperative ICU stays compared to the control group.

Conclusion: Administration of prophylactic Non-Invasive Positive Pressure Ventilation (NIPPV) and TENS as combined ancillary therapy may improve tissue perfusion, reduce post operative pain at coughing, pulmonary complications, and decreases the length of intensive care stay in off-pump coronary artery bypass graft (CABG) patients with good left ventricular (LV) or mild left ventricular (LV) dysfunction during the acute phase I of cardio-pulmonary rehabilitation, when compared to standard treatment alone.

Keywords: Non-Invasive Positive Pressure Ventilation, Transcutaneous Nerve Stimulation, Blood Lactate, Mixed Central Venous Oxygenation, Numerical Pain Rating Scale.

Bahrain Med Bull 2024; 46 (4): 2442-2450

* Chettinad School of Physiotherapy, Chettinad Hospital and Research Institute, Chettinad Academy of Research and Education (CARE), Kelambakkam, Tamil Nadu - 603103, India. Email - senthilp101010@gmail.com

** Department of Medicine Division of Adult Critical care
King Khalid University, Abha, Aseer Region, Saudi Arabia.

*** Chettinad Super Specialty Hospital
Cardio-Thoracic Vascular Surgical Department, Chettinad Health City
Kelambakkam, Chennai, India.

**** Aseer Central Hospital, Abha, Aseer Region, Saudi Arabia.

***** University Tunku Abdul Rahman, JalanSungai long, Selangor, Malaysia.

***** Faculty of Allied Health Professionals, AIMST University, Malaysia.