

2ND INTERNATIONAL CONFERENCE ON CARDIOLOGY AND CARDIOVASCULAR MEDICINE

July 16-17, 2025 | Rome, Italy



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Hypoxic preconditioning – a prehabilitation method to reduce perioperative complications in patients undergoing cardiac surgery by cardiopulmonary bypass

Introduction

Postoperative cardiovascular complications within 30 days reaches 50,1%, most of which are due to insufficient blood supply, oxidative stress developed in ischemic-reperfusion myocardial injury.

Methods

A single-center prospective randomized placebo-controlled study was conducted in the Cardiac Surgery department of the I.M. Sechenov First Moscow State Medical University, registered at ClinicalTrials.gov (NCT04833283). 110 patients aged 20 to 78 years with valve defects and/or aortic aneurysm in stable clinical condition referred for elective surgery by cardiopulmonary bypass (CBP) are randomized into experimental (66 patients receiving of 3-7 Intermittent hypoxic-hyperoxic exposures (IHHE) and control group (44 patients, receiving placebo-IHHE). All patients were monitored during hospitalization and remotely - for 30 days after discharge. Before surgery, all patients underwent standard preoperative preparation and examination. IHHE were started 4-7 days before surgery (ReOxy Cardio, Ai Mediq S.A., Luxembourg). Fatal and nonfatal complications in peri- and postoperative periods were registered as well as cardiac troponins I and T (TnI and TnT) were measured before, 2 and 24 hour after surgery.

Results

Two groups did not differ in most clinical and demographic parameters. The risk of surgery (Euroscore II scale) was comparable. 2 and 24 hours after cardiosurgery, a significant increase in TnI/TnT values was noted in both groups, but the degree of increase in IHHE group was significantly less. Also almost all indicators of the perioperative cardiac and noncardiac complications were significantly less in IHHE group.

Conclusion

The use of IHHE as prehabilitation of patients for cardiac surgery with CBP reduces the degree of ischemia-reperfusion myocardial injury (assessed by TnI and TnT dynamics) and reduces the risk of complications both during surgery and in the early postoperative period.

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