A MINIMALLY INVASIVE CLOSED-CHEST MODEL FOR EXPERIMENTAL MYOCARDIAL INFARCTION vs SURGICAL MODEL

Sofoklis Mitsos[1], Konstantinos Katsanos[2], Efstratios N Koletsis[1], Vassiliki Mougiou[1] , Vassiliki Bravou[3], Dimitrios Karnabatidis[2], Fevronia Kolonitsiou[4], Dimitrios Siablis[2], Dimitrios Dougenis[1]

[1]Departments of Cardiothoracic Surgery; [2]Interventional Radiology; [3]Anatomy, [4]Microbiology, University of Patras, School of Medicine , Rion, Greece

Introduction

Most animal studies of myocardial ischemia have used open-chest models with direct surgical coronary artery ligation, which is associated with local and systemic side effects of major surgery. The aim of this study was to develop a novel percutaneous closed-chest model of myocardial infarction in the New Zealand White rabbit

Methods

New Zealand White rabbits underwent experimental myocardial ischemia (EMI) in conformity with the "Guide for the Care and Use of Laboratory Animals". Group A underwent EMI with an open-chest method involving surgical tracheostomy, a subxiphoid incision and left anterior descending (LAD) coronary artery ligation with a plain suture, whereas Group B underwent EMI with a closed-chest method involving fluoroscopic-guided percutaneous transauricular intra-arterial access, superselective catheterization of the LAD and distal coronary embolization with a micro-coil. Various cardiac parameters including electrocardiography (ECG), serum cardiac enzymes and assessment of left ventricular end-diastolic pressure (LVEDP) with transcatheter measurements were recorded. Surviving animals were euthanized after 4 weeks and the hearts were harvested for further histomorphometry with hematoxylin-eosin (H&E) and Masson trichrome staining.

Results

Increase of troponin, existence of ischemic Q waves and increase of LVEDP to a similar extent in both groups12.7 ± 2.0 vs 12.9 ± 2.3 mmHg before euthanasia, compared to 6.2 ± 1.7 vs 6.7 ± 1.8 mm Hg at baseline for the surgical group and the percutaneous group, respectively were recorded. ST-segment elevation (1.90 ± 0.71 mm) occurred sharply after surgical LAD ligation compared to progressive ST elevation (2.01 ± 0.84 mm;p = 0.68) within 15-20 min after LAD micro-coil embolization. Finally, the diameter of infracted area was 0.86 ± 0.35 cm in the surgical group vs. 0.92 ± 0.54 cm in the percutaneous group;p = 0.68

Discussion

The presented minimal invasive experimental model of myocardial infarction is a reliable platform for the study of myocardial ischemia.It avoids major surgery and thoracotomy and is also reproducible with a pathophysiology similar to human pathology without statistically significant difference in troponin increase, LVEDP measurement and histopathologic results in comparison with surgical model.