ABSTRACT

Background: Surgical procedures are invariably accompanied by the use of inhalational and intravenous anesthetics. Both groups have strong influence on cardiovascular system by the interaction with myocardial oxygen supply/demand ratio and cardiomyocyte functions at the level of cell membranes, ion channels and regulatory enzymes.

Aims: 1. To examine the effects of different isoflurane concentrations on the left ventricular (LV) dimensions and systolic function in the rat. 2. To examine the effects of isoflurane-induced myocardial preconditioning (APC) on the cardiac tolerance to ischemia-reperfusion (I-R) injury. 3. To compare the influence of anesthesia, based on ketamine–dexmedetomidine (KET-DEX), on the release of biochemical markers of myocardial injury and the early postoperative course with the anesthesia, based on sevoflurane–sufentanil (SEVO), in the patients undergoing coronary artery bypass grafting (CABG).

Methods: 1. We carried out transthoracic echocardiographic examination in the rats immobilized by 1.5–3% concentration of isoflurane. 2. After inducing APC by isoflurane (0.5 and 1 MAC), we evaluated ventricular arrhythmias during regional ischemia (45 min), induced by the occlusion of the left anterior descending artery, and subsequent reperfusion (60 min), using the model of isolated perfused rat heart; infarct size (IS) was delineated by potassium permanganate and tetrazolium staining. 3. We compared the levels of cardiac biomarkers (CK-MB, cTnI) and the early postoperative course using retrospective observational analysis.

Results: 1. Isoflurane in 1.5–3% concentration did not influence the thickness of the LV anterior and posterior walls, but 3% concentration significantly increased the LV end-systolic and end-diastolic diameters together with end-diastolic volume; heart rate and LV fractional shortening did not change. 2. APC induced by both isoflurane concentrations increased the cardiac tolerance to I-R injury; the number and severity of ventricular arrhythmias significantly decreased during ischemia, and the time interval to the occurence of the first premature ventricular complex significantly increased. The incidence and severity of arrhythmias during reperfusion decreased; infarct size, normalized to the of area at risk, decreased by half. 3. The patients after KET-DEX anesthesia had significantly lower cTnI and CK-MB levels on the morning after surgery accompanied by a significantly lower overall cTnI release compared with SEVO anesthesia; the early postoperative course did not differ between the groups.

Conclusions: 1. Isoflurane concentrations, commonly used for rat immobilization (≤2.5%), did not significantly influence LV dimensions and systolic function. 2. Isoflurane-induced APC significantly increased the cardiac tolerance to I-R injury; it had significant antiarrhythmic effects and decreased also infarct size. 3. Ketamine–dexmedetomidine anesthesia during elective CABG resulted in lower postoperative levels of cardiac biomarkers compared with sevoflurane–sufentanil anesthesia.