

Varying Degrees of Hemolysis and Vasoactive Properties

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Received Date: November 05, 2025; Accepted Date: November 20, 2025; Published Date: December 01, 2025

Citation: Maksimovich Yelizaveta, (2025), Varying Degrees of Hemolysis and Vasoactive Properties, *Clinical Trials and Clinical Research*,4(6); DOI:10.31579/2834-5126/120

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Abstract

Further, the use of cardiopulmonary bypass (CPB) during CABG, necessary for maintaining blood circulation during the operation, is associated with potential red blood cell damage. This hemolysis may contribute to the development of cardiovascular complications in the postoperative period [14]. However, the specific relationship between intraoperative hemolysis (IOH) and the development of arrhythmias following CABG remains unclear in the existing literature.

Keywords: coronary artery bypass grafting; hemolysis; arrhythmias

Introduction

Their pathogenesis is due to reperfusion syndrome. The most important mechanism is oxidative stress [1,2]. Another factor of complications of coronary artery bypass grafting is the use of artificial circulation. Carrying out CABG is accompanied by hemolysis of erythrocytes because of mechanical damage [3,4]. Coronary artery bypass grafting (CABG) in patients with coronary artery disease (CAD) improves the quality of life of patients, but various complications may develop.

Purpose of the study: to study the vasoactive properties of the endothelium in patients with varying degrees of hemolysis during coronary artery bypass grafting operations under artificial circulation (AC).

Research methods

The studies were conducted in 34 patients with CABG. The degree of hemolysis was assessed during coronary artery bypass grafting with artificial circulation. The study of the vasoactive properties of the endothelium was carried out using a reactive hyperemia test. Determination of the vasoactive properties of the endothelium was carried out one day before the operation and on the fifth day after CABG.

Results

of the research. In patients with coronary artery bypass grafting under artificial circulation, worsening of endothelial dysfunction was revealed in patients with a hemolysis value of 0.6-0.8 g / l (n = 8) compared to the preoperative period by 28% (p < 0.05), while in patients with hemolysis of 0.1-0.2 g / l (n = 10), worsening of endothelial dysfunction was 5% (p > 0.05). These differences between the groups were significant. In 18 patients, the degree of hemolysis was 0.3-0.5 g / l. After the test with nitroglycerin

using endothelium-independent vasodilation of vessels was not revealed. It was shown that in all groups of patients, the guanylate cyclase mechanism of vasodilation was absent.

Conclusions

Thus, the conducted studies have shown the aggravation of endothelial dysfunction after CABG depending on the degree of intraoperative hemolysis (IOH), and these results also indicate an adverse effect of red blood cell destruction products on the vascular endothelium. This may be due to the initiation of circulating red blood cell debris, free hemoglobin, heme, iron in the bloodstream, which can enhance oxidative stress, the leading mechanism of reperfusion damage to tissues and organs caused by the restoration of blood flow. The conducted studies have shown the adverse effect of CABG on the vasoactive properties of the vascular endothelium and their dependence on the degree of intraoperative hemolysis, the level of free iron and nitric oxide, as well as the activity of oxidative stress. Based on the above, the degree of vascular endothelial dysfunction can act as a kind of marker indicating the aggressiveness of cytotoxic reperfusion mechanisms and can be the cause of indirect myocardial damage after restoration of blood flow because of CABG using CPB.

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