

Analysis of risk factors of acute hepatic damage after open-heart surgery.

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Abstract

Objective: To analyze the risk factors of acute hepatic damage in patients after open-heart surgery.

Methods: We selected 92 patients who underwent open-heart surgery for treatment in this hospital between July 2016 and July 2017 as the subjects who were then divided into two groups according to the onset of postoperative acute hepatic injury, i.e. the observation group (n=49) and the control group (n=43). Patients in the observation group experienced the onset of acute hepatic injury after surgery, but those in control group did not, and we evaluated the relevant risk factors of acute hepatic injury for patients after open-heart surgery.

Results: One-way analysis of variance showed that age (≥ 65 years), chronic viral hepatitis, preoperative right heart failure, excessively long time of extracorporeal circulation (≥ 2 h), blood products administration (≥ 1000 mL), low preoperative cardiac output, severe infection and hypoxemia were factors that could induce the acute hepatic injury in patients after open-heart surgery. According to the results of Logistic regression multivariate analysis showed that preoperative hepatic injury, excessively long time of extracorporeal circulation (≥ 2 h), blood products administration (≥ 1000 mL), low preoperative cardiac output, and hypoxemia were independent risk factors leading to the acute hepatic injury in patients after open-heart surgery.

Conclusion: The incidence of acute hepatic injury after open-heart surgery is correlated with the preoperative hepatic injuries and caused by the effects of various factors; thus, based on the comprehensive understanding on the relevant factors, we should maximally reduce the incidence rate of acute hepatic injury after open-heart surgery through correct clinical treatment.

Keywords: Open-heart surgery, Postoperative, Acute hepatic injury, Risk factor.

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Introduction

Hepatic injury is one of severe complications in open-heart surgery with extracorporeal circulation, which could significantly affect the prognosis of patients [1]. Comprehensive analysis of the clinical characteristics and regularity of hepatic injury after open-heart surgery can help us to better evaluate the prognosis of clinical treatment, which in turn facilitates the design of surgery procedures and improves the clinical efficacy to protect the health and life of these patients. Literature [2] has reported that after open-heart surgery, the incidence of acute hepatic injury is closely associated with the preoperative underlying diseases of patients. Moreover, in some studies [3], they found that the incidence of acute hepatic injury is also related with the age of patients. Despite that there are various factors being involved in the incidence of acute hepatic injury after open-heart surgery, few studies focus on the comprehensive analysis on the factors in relation to the incidence of acute hepatic injury after open-heart surgery. Thus, in this study, 92 patients who underwent the open-heart surgery in this hospital between July

2016 and July 2017 were enrolled as the subjects, and divided into the observation group and the control group according to the onset of acute hepatic injury after open-heart surgery; with the results, we explored the risk factors relating to the acute hepatic injury after open-heart surgery via one-way and multivariate statistical analysis, thereby providing evidence for clinical treatment of these patients.

Materials and Methods

General material

A total of 92 patients who underwent open-heart surgery in this hospital between July 2016 and July 2017 were enrolled as the subjects, and they were divided into two groups according to the onset of postoperative acute hepatic injury, i.e. the observation group (n=49) and the control group (n=43). Those with acute hepatic injury after open-heart surgery were enrolled into the observation group, where there were 25 males and 24 females aged between 22 and 81 years old with an average age of (64.01 ± 3.23) years old; remaining 43 patients

without onset of acute hepatic injury were enrolled in the control group, in which there were 24 males and 19 females aged between 22 and 79 years old with an average age of (63.99 ± 3.14) years old. Before enrollment, patients and their family had already been informed of the content of this study, and signed the written informed consent. Comparison of the general data between the two groups showed no statistically significant difference, suggesting that their general data were comparable ($p > 0.05$).

Methods

The basic data and correlated indexes of patients were recorded, including the age (especially for patients aged ≥ 65 years old), rheumatic heart disease, severe infection and hypoxemia, complications like chronic viral hepatitis and preoperative jaundice, duration of open-heart surgery (≥ 2 h), blood product administration (> 1000 mL) and low cardiac output after surgery, etc. [4].

Evaluation criteria

In this study, we assessed the risk factors relating to the acute hepatic injury after open-heart surgery. Hepatic injury was diagnosed according to the following criteria: the level of alanine aminotransferase in serum higher than the normal range (0 to 461 U/L) or aspartate aminotransferase in serum higher than the normal range (0 to 461 U/L) [5]. Also, acute viral hepatitis was excluded through the examination of antigen-antibody system of hepatitis.

Statistical methods

Data were analyzed using SPSS 19.0, in which measurement data were presented as ($\bar{x} \pm s$), and t test was performed for intergroup comparison, while the chi-square test was applied for the comparison of count data. Independent risk factors were identified through Logistic regression analysis. $p < 0.05$ suggested that the difference had statistical significance.

Results

One-way ANOVA

The results of one-way ANOVA showed that ages ≥ 65 years, chronic viral hepatitis, rheumatic heart disease, preoperative right heart failure, duration of open-heart surgery ≥ 2 h, blood product administration ≥ 1000 mL, low preoperative cardiac output, severe infection and hypoxemia were potential factors inducing the acute hepatic injury after open-heart surgery (Table 1).

Table 1. One-way ANOVA.

Factors	Observation group (n)	Control group (n)	χ^2	p
≥ 65 years	32	12	13.341	0.001
Chronic viral hepatitis	19	2	8.233	0.004

Rheumatic heart disease	7	0	4.522	0.018
Preoperative right heart failure	8	0	5.112	0.021
Duration of open-heart surgery ≥ 2 h	15	3	4.777	0.029
Blood product administration ≥ 1000 mL	14	3	4.562	0.031
Low preoperative cardiac output	25	7	9.112	0.004
Severe infection	9	0	4.880	0.021
Hypoxemia	18	1	8.346	0.004

Multivariate analysis

The logistic regression multivariate analysis showed that preoperative hepatic injury, excessively long time of extracorporeal circulation (≥ 2 h), blood products administration (≥ 1000 mL), low preoperative cardiac output, and hypoxemia were independent risk factors leading to the acute hepatic injury in patients after open-heart surgery (Table 2).

Table 2. Logistic regression multivariate analysis.

Factors	Odds ratio	95% CI	p
Preoperative hepatic injury	2.10	1.14-3.91	0.02
Excessively long time of extracorporeal circulation ≥ 2 h	2.44	1.23-4.58	0.005
Blood products administration ≥ 1000 mL	3.01	1.11-5.32	0.006
Low preoperative cardiac output	2.16	1.32-6.65	0.013
Hypoxemia	2.56	1.08-4.79	0.011

Discussion

With specific pathophysiological features, extracorporeal circulation can not only affect the hepatic functions, but also severely influence the major organs and microcirculation in patients [6-8]. Thus, extracorporeal circulation, as a major method for artificially sustaining the shock status, usually leads to a decrease in intraoperative hepatic perfusion, thereby resulting in damages to liver functions. Open-heart surgery is an effective method for alleviating the symptoms of heart disease patients, which can significantly increase the success rate of operation [9-12], but has been considered as one of major causes responsible for the postoperative death of patients, i.e. the acute hepatic injury. After operation, the incidence rate of the hepatic injury is relatively high, and, therefore, has been regarded as a key factor influencing the prognosis of patients after open-heart surgery [13-15]. Based on the comprehensive understanding on the related factors, we adopted the symptomatic treatment to reduce the incidence rate of postoperative acute hepatic injury, so as to guarantee the prognosis of patients.

In this study, we found that compared with the patients in the control group, the age and the quantity of complications of

patients in the observation group were all higher. Meanwhile, the patients with preoperative hepatic damages, duration of open-heart surgery >2 h or heavy intraoperative bleeding in the observation group were more than those in the control group, and the difference had statistical significance. Through the one-way ANOVA, we found that ages ≥ 65 years, chronic viral hepatitis, rheumatic heart disease, preoperative right heart failure, duration of open-heart surgery ≥ 2 h, blood product administration ≥ 1000 mL, low preoperative cardiac output, severe infection and hypoxemia were potential factors inducing the acute hepatic injury after open-heart surgery. Furthermore, the logistic regression multivariate analysis showed that preoperative hepatic injury, excessively long time of extracorporeal circulation (≥ 2 h), blood products administration (≥ 1000 mL), low preoperative cardiac output, and hypoxemia were independent risk factors leading to the acute hepatic injury in patients after open-heart surgery. Therefore, risk factors of acute hepatic injury should be excluded before, in and after operation, so as to reduce the incidence rate of acute hepatic injury.

In conclusion, the incidence of acute hepatic injury after open-heart surgery is closely associated with the factors like preoperative hepatic injury or hypoxemia, which is caused by the effects of multiple factors; thus, based on the comprehensive understanding on the relevant factors, we should maximally reduce the incidence rate of acute hepatic injury after open-heart surgery through correct clinical treatment.

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