Original Article

Dyslipidemia and Outcome in Patients with Acute Ischemic Stroke[*]

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Abstract

Objective   To study the relationship between dyslipidemia and outcome in patients with acute ischemic stroke.

Methods   Data about 1 568 patients with acute ischemic stroke were collected from 4 hospitals in Shandong Province from January 2006 to December 2008. National Institute of Health Stroke Scale (NIHSS) >10 at discharge or death was defined as the outcome. Effect of dyslipidemia on outcome in patients with acute ischemic stroke was analyzed by multivariate logistic regression analysis and propensity score-adjusted analysis, respectively.

Results   The serum levels of TC, LDL-C, and HDL-C were significantly associated with the outcome in patients with acute ischemic stroke. Multivariate logistic regression analysis and propensity score-adjusted analysis showed that the ORs and 95% CIs were 3.013 (1.259, 7.214)/2.655 (1.298, 5.43), 3.157 (1.306, 7.631)/3.405 (1.621, 7.154), and 0.482 (0.245, 0.946)/0.51 (0.282, 0.921), respectively, for patients with acute ischemic stroke. Hosmer-Lemeshow goodness-of-fit test showed no significant difference in observed and predicted risk in patients with acute ischemic stroke (chi-square=8.235, P=0.411).

Conclusion   Serum levels of TC, LDL-C, and HDL-C are positively related with the outcome in patients with acute ischemic stroke.

Key words: Dyslipidemia; Acute ischemic stroke; Outcome; Multivariate logistic regression analysis; Propensity score-adjusted analysis

INTRODUCTION

Stroke is a leading cause of long-term worldwide[1] and the second most common cause of death in China, accounting for nearly 20% of all deaths in both rural and urban settings[2]. Dyslipidemia is a major risk factor for cardiovascular diseases[3-4]. Most studies have focused on the relationship between serum level of lipid and incidence of ischemic stroke,

but their findings are inconsistent[5-8]. Few studies are available on the relationship between serum lipid level and outcome in patients with ischemic stroke.

Considering the low outcome incidence rate, excessive number of confounding factors and potential collinearity in this study, multivariable logistic regression analysis may not be ideal for estimating the exposure effects[9]. Instead, propensity score-adjusted analysis can be used in these situations since propensity score is a conditional probability which is treated as a composite confounding factor in multivariate logistic regression analysis[10-11].

MATERIALS AND METHODS

Study Participants

This study was conducted from January 1 of 2006 to December 31 of 2008 in acute ischemic stroke patients with their diagnosis established by CT or MRI. The study was approved by Ethics Committee of Soochow University Public Health School.

Data Collection

Baseline data were collected within 24 h after admission by interview with the patients or their family members. Demographic data, life-style risk factors, medical history, clinical laboratory tests, and CT and MRI data were collected using a standard questionnaire. Blood pressure was measured within 30 min after admission, the study participants were placed in the supine position as previously described[12]. The patients with acute ischemic stroke were assessed at admission and discharge according to the NIHSS[13].

Blood samples were taken from the patients within 24 h after admission. Plasma glucose levels were measured as previously described[14]. Serum levels of TC, HDL-C, and TG were measured with the Beckman Synchron CX5 Delta Clinical System (Beckman Coulter, Inc., Fullerton, California, USA)[15]. Serum LDL-C level was measured according to the Friedewald equation[16].

Statistical Analysis

The continuous and categorical variables were calculated for NIHSS≤10 at discharge and NIHSS>10 / death. P values were calculated by analysis of variance for the difference in mean of continuous variables, and by χ^2 test or Fisher exact test for the difference in categorical variables.

The cut-points of TC, TG, LDL-C, and HDL-C was ≥6.22 mmol/L, ≥2.26 mmol/L, ≥4.14 mmol/L, and <1.04 mmol/L, respectively, in patients with acute ischemic stroke according to the Chinese guidelines on prevention and treatment of dyslipidemia in adults (2007)[17]. The dichotomous variable was used as the outcome based on NIHSS>10/death or NIHSS≤10 at discharge while the serum levels of TC, TG, HDL-C, and LDL-C were used as the binary exposure variables. The covariates including age, gender, alcohol consumption, cigarette smoking, systolic and diastolic blood pressure, fasting glucose level, admission NIHSS, history of stroke, hypertension, diabetes, coronary and rheumatic heart disease, atrial fibrillation and lipid levels depending on the exposure variables were adjusted in multivariate logistic regression analysis. The effect of dyslipidemia on outcome in patients with ischemic stroke was also analyzed by propensity score-adjusted analysis. The propensity score was calculated based on the covariates and divided into 5 quintiles. Integration of a propensity score by 5 quintiles into the analysis may provide more comparability between covariate distributions[9]. The significant dyslipidemia components and other risk factors including age, gender, blood pressure, fasting glucose level, atrial fibrillation history and admission nihss were analyzed to predict outcome incidence rate. Model calibration was assessed by Hosmer–Lemeshow goodness-of-fit test. P values were two-tailed and $P<0.05$ was considered significantly different. All statistical analyses were conducted using SAS statistical software (version 9.2) and R statistical package (version 2.15), respectively.

RESULTS

A total of 1 568 patients with acute ischemic stroke were included in this study. The demographic and clinical data are shown in Table 1. The age, fasting glucose level and incidence of atrial fibrillation history were higher in patients with their NIHSS>10 at discharge or death than in those with their NIHSS<10 at discharge. Marginal significant difference was observed in systolic blood pressure between the two groups. Figure 1 shows the outcome incidence rate in patients with ischemic stroke according to different lipid levels. The outcome