Prognostic value of LDL to HDL cholesterol ratio in patients undergoing coronary stenting

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Purpose

There is overwhelming evidence that an elevated low-density lipoprotein cholesterol (LDL-C) concentration in plasma is atherogenic, whereas a high-density lipoprotein cholesterol (HDL-C) level is cardioprotective. A series of studies suggested that the use of the ratio of LDL-C to HDL-C, which can be obtained from a standard lipid profile, is superior to the use of HDL-C or LDL-C alone and that the ratio of LDL-C/HDL-C may provide better risk assessment by concurrently accounting for both atherogenic and protective lipid fractions. In this work, we mainly clarified whether the LDL-C/HDL-C ratio would influence long-term clinical outcome in patients after PCI and evaluated the predictive usefulness of LDL-C/HDL-C ratio after PCI.

Methods

We assessed a population composed of 1300 consecutive patients with acute coronary syndrome, undergoing percutaneous coronary intervention (PCI) with implantation of drug-eluting or bare metal stents in the period from November 2006 and December 2008 in our Division of Cardiology. Exclusion criteria were, cardiogenic shock, previous stent in the target vessel area, coronary artery bypass graft (CABG) within 48 hours of coronary artery surgery, pregnancy, malignant tumor, life expectancy <1 years, implantation of two different kind of stent in the same patient, liver dysfunction; familiar hypercholesterolemia; familial hypertriglyceridemia (TG) > 400 mg/dl. Left ventricular ejection fraction <30%. In this manner, a final sample size of 504 (48.76%) of 1300 patients were enrolled. Blood lipid profile data were evaluated on venous blood samples in the fasting state (12 hours) just before percutaneous coronary intervention (PCI). Total cholesterol (TC), triglycerides (TG), HDL-C were measured using conventional enzymatic methods. LDL-C levels were calculated using Friedewald’s formula. After we calculated non-HDL-C, by difference between total cholesterol (TC) and HDL-C, LDL-C, TG/HDL-C and non-HDL-C/HDL-C ratio. The endpoint was the rate of major adverse cardiac events (MACE) defined as occurrence of cardiac death, new hospitalization for ACS (Acute Coronary Syndromes), target vessel revascularization (TVR) and stroke. Follow up of clinical end points was conducted for up 3 years after PCI.

Statistical analysis

Spearman correlation analysis was performed between LDL-C/HDL-C ratio and marker of inflammation. Multivariable logistic regression model with stepwise selection was used to identify independent factor associated with outcomes. The areas under the curve (AUC) of the receiver operating characteristic curves (ROC) were constructed to assess the degree of predictability of lipids and ratios of interest on cardiovascular risk.

Results

The study population consisted of 504 patient with mean age of 65.01 ± 10.85 years, most of the patients were male (74.7%). The baseline sample was divided into 3 groups. LDL-C/HDL-C ≥1.5 group (n=105), 1.5< LDL-C/HDL-C ≤2.0 group (n=140), and LDL-C/HDL-C <2.0 group (n=259). The groups were different regarding to lipid profile, moreover the patients of Group 3 had significantly higher proportion of diabetes compared with patients of group 1 and group 2 (p = 0.034). In contrast, in the Group 1 and 2 was a significantly higher proportion of previous MI compared with Group 3 (p = 0.003).

In addition, among three groups, there was a clear trend for higher C-reactive protein (CRP) levels and fibrinogen associated with increasing of LDL-C/HDL-C ratio, but the differences did not reach statistical significance.

However we searched for possible correlations between LDL-C/ HDL-C ratio and marker of inflammations (data not shown) and we found a significant correlation with fibrinogen (r = -0.094, p < 0.004) and CRP (r = +0.094). There were no significant differences for all other variable and all three groups did not differ with regard to medications.

At the end of three years follow up overall MACE were observed in 22 patients (20.95%) of the LDL-C/HDL-C ≥1.5 group, in 39 patients (27.85%) of the 1.5< LDL-C/HDL-C ≤2.0 group and in 118 patients (45.55%) of the LDL-C/HDL-C <2.0. (Table 2)

We used logistic regression analysis in order to identify the independent predictor for occurrence of MACE during follow up. Multivariate logistic regression analysis was adjusted for all variables at univariate analysis showed p value ≤0.10 and we found that LDL-C/HDL-C ratio (OR: 1.593; 95% CI: 1.235-1.901; p < 0.0001) and fibrinogen (OR: 1.003; 95% CI: 1.001-1.005; p = 0.0004) were significant predictors of MACE after PCI.

Conclusion

This study showed that the three groups were significant different about lipid profile and ratios but that only LDL/HDL-C ratio was significant predictor of occurrence of MACE in patient undergoing PCI, on long term outcome after PCI. From multivariate analysis came up from, too, that the fibrinogen was an important predictor for another very interesting aspect was that, after comparison the area under the ROC curve, built only from lipid profile, the area under the ROC curve was largest for the LDL/HDL-C ratio, than that for another lipids and lipid ratios. Especially, after the receiver operating characteristic (ROC) curve analysis, the cut-off point of LDL-C/HDL-C ratio to identifying of occurrence of MACE, was ≥1.85. In conclusion, pending further studies to confirm these results, in light of these data, it would be important to be able to better understand the role of to assess if pre-procedural risk stratification with lipid ratio of LDL-C/HDL-C might be used as an integrated and simple lipid measure to the risk of adverse events after PCI, so as secondary prevention as an adjust to established clinical risk factors may be useful as form of prevention for early identification of high risk patients for MACE, and a better understanding the relationship between the LDL-C/HDL-C and fibrinogen is needed. Research now in progress will almost certainly help clarify the picture.

References


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