Ergonovine-Induced Changes of Coronary Artery Diameter in Patients with Nonsignificant Coronary Artery Stenosis

Relation with Lipid Profile

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Abstract
Background and Purpose: Serum cholesterol is positively associated with the risk of developing coronary heart disease. The aim of this study was to determine the relation between response of coronary arteries to ergonovine provocation and lipid profile in patients with nonsignificant coronary artery disease.

Patients and Methods: 105 patients (46 male, 59 female, mean age 52 ± 8 years) with chest pain syndrome and nonsignificant coronary artery stenosis (< 50% diameter stenosis) were analyzed. Ergonovine test was performed at the end of diagnostic catheterization. Coronary spasm was defined as total or near total obstruction of the coronary artery. By quantitative coronary arteriography, changes of minimal luminal diameter (MLD) during ergonovine provocation were evaluated. Total cholesterol, LDL and HDL cholesterol, and triglycerides were measured.

Results: There was a significant negative correlation between resting MLD and LDL cholesterol (r = –0.215; p = 0.034), and a significant positive correlation between MLD increase provoked by ergonovine and total cholesterol (r = 0.275; p = 0.006), as well as LDL cholesterol (r = 0.284; p = 0.004), but not for HDL cholesterol and triglycerides (p = NS [not significant]).

Conclusion: In patients with nonsignificant coronary artery stenosis evaluated by ergonovine provocation, there was not only a significant negative correlation between MLD and LDL cholesterol, but also a positive correlation between coronary vasoconstriction induced by ergonovine provocation and both total and LDL cholesterol.

Key Words: Ergonovine · Cholesterol · Angiography

Zusammenfassung


Ergebnisse: Es gab eine signifikante negative Korrelation zwischen dem MLD in Ruhe und dem LDL-Cholesterin (r = –0.215; p = 0.034). Eine signifikante positive Korrelation bestand zwischen dem MLD und dem Gesamtdurchmesser (r = 0.275; p = 0.006) sowie dem LDL-Cholesterin (r = 0.284; p = 0.004), aber nicht zum HDL-Cholesterin und zu den Triglyzeriden (p = NS [nicht signifikant]).

Schlüsselwörter: Ergonovine · Cholesterin · Angiographie
**Introduction**

Ergonovine testing has been successfully used for detection and confirmation of coronary artery spasm in patients with variant angina [1–7]. However, in patients without history of variant angina, but chest pain and nonsignificant coronary artery stenosis, coronary vasospasm is not rare and can also be efficiently identified by ergonovine testing [8, 9]. In addition, we have previously shown that myocardial ischemia during ergonovine provocation may be the consequence not only of subtotal or total coronary obstruction, but also of significant vasoconstriction producing a critical decrease in myocardial perfusion, as demonstrated by echocardiographic signs of myocardial ischemia [9].

Numerous studies have shown that serum cholesterol, reflecting LDL cholesterol concentration, is positively associated with the risk of developing coronary heart disease [10]. The relation between ergonovine-induced coronary vasospasm and lipid profile has been addressed in previous reports, but the conclusions were not homogeneous [8, 11–13]. In fact, most experimental studies have found the relation between high cholesterol diet inducing atherosclerosis and vasoconstriction, whereas clinical studies, among the clinical risk factors for development of vasospasm, have emphasized the role of smoking but not cholesterol. Therefore, the aim of our study was to evaluate the relation between lipid profile and ergonovine-induced vasmotion of coronary arteries in a consecutive group of patients with nonsignificant coronary artery disease and without previous history of variant angina and coronary vasospasm.

**Patients and Methods**

**Study Population**

Ergonovine testing was performed in 105 consecutive patients (46 male, 59 female, mean age 52 ± 8 years) with chest pain syndrome and hemodynamically nonsignificant coronary artery stenosis (< 50% diameter stenosis). None of the patients suffered from previous myocardial infarction, congestive heart failure, severe congenital or valvular heart disease, or documented cardiomyopathy. All drug medications that may influence the response of coronary arteries to ergonovine, were stopped 48 h before testing, except ACE inhibitors and short-acting nitrates. The ethics committee of our clinical center approved the study, and informed consent was obtained from all patients.

Before angiography and after overnight fasting, we measured total cholesterol, LDL and HDL cholesterol, as well as triglycerides in all patients. Lipid profile was measured in serum using the following methods: total cholesterol and HDL cholesterol were evaluated by enzymatic endpoint method, LDL cholesterol by the calculation method according to the Friedewald formula, and triglycerides by the GPO-PAP (glycerol phosphate oxidase-phenol aminophenazone) method.

**Stress Protocol and Angiographic Analysis**

The ergonovine test was performed in consecutive patients at the end of diagnostic catheterization disclosing discrete nonsignificant coronary artery stenosis and normal left ventriculography. Angiographic evaluation during ergonovine testing was performed in the view best showing coronary lesion. Doses of 0.05, 0.10, and 0.20 mg of ergonovine maleate were given intravenously in succession at 3-min intervals, followed after 3 min by intracoronary injection of 200 µg nitroglycerin. Angiography was performed in the same view, under identical technical conditions, before the study, at the end of each stage of ergonovine administration, and after nitroglycerin injection. Blood pressure, heart rate, and ECG were monitored continuously and recorded before, and at the end of each stage of the study protocol.

Coronary arteriography images were digitized and analyzed (off-line) with the quantitative coronary angiography imaging system (Medis CMS, Leiden, The Netherlands, software version 1.11, utilizing automated edge detection) by an observer unaware of the patient’s clinical data. After visual inspection of the coronary artery, the frame of optimal clarity in the end-diastolic part of the cardiac cycle was selected. To study response of coronary arteries to ergonovine administration, the starting point was selected at the proximal part of coronary artery and the ending point was placed at the distal part of coronary artery. To study the repetitive responses of coronary artery to increasing doses of ergonovine, we evaluated the same section of coronary artery and the site of minimal luminal diameter (MLD) was determined from the basal conditions. For the purpose of further analysis, we measured basal and peak ergonovine MLD and percent diameter stenosis, as well as difference between peak and basal MLD and percent diameter stenosis. By quantita-

**Schlussfolgerung:** Bei Patienten mit einer nichtsignifikanten Koronarstenose fand sich eine signifikante negative Korrelation zwischen dem MLD in Ruhe und dem LDL-Cholesterin. Nach Provokation mit Ergonovin zeigte der Grad des erzeugten Koronarspasms eine positive Korrelation zum Gesamt- und zum LDL-Cholesterin.