INTRAOPERATIVE FINDINGS OF SEVERITY OF CORONARY ARTERY DISEASE: THE IMPORTANCE OF LOW - DENSITY LIPOPROTEIN CHOLESTEROL CONTROL

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Abstract — The correlation between severity and extent of coronary artery disease (CAD) and lipid measurement was assessed in 152 patients undergoing coronary artery bypass graft surgery (CABG). The severity and extent of CAD was determined under direct vision of a cardiac surgeon during the CABG. Patients were divided into two groups: 1. those with very severe and diffuse CAD that all their coronaries were severely diseased. 2) those with less severe CAD that their involvement limitted to certain coronary branches. Patient with all coronary involvement revealded significantly higher mean level of low density lipoprotein cholesterol (LDL-C). These paitents had also higher mean levels of total cholestrol (TC) and lower mean high density lipoprotein (HDL-C); but these differences were not statistically significant. Only 18% of our patients had desirable lipid levels after CABG. We concluded that higher (LDL-C) levels may related with more severe CAD. However, this is a cross-sectional study; so a carefull controlled prospective study is recommended. Because new studies revealed that lower (LDL-C) levels (LDL <100) mg/dl help to maintenance of graft's patency, more attention to LDL-C control after CABG is necessary.
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Key words: LDL-C; HDL-C; CAD; CABG.

INTRODUCTION

Prospective epidemiological studies have identified several independent coronary risk factors, including smoking, dyslipidemia, hypertension, and diabetes miellitus (1). In these studies the risk of myocardial infarction was found directly related to the concentration of TC and LDL - cholesterol and inversely related to HDL-cholesterol (2,3,4). In more recent studies coronary risk was found to be positively associated with the serum concentration of apo-B, which is the exclusive protein component of LDL, and negatively with the serum concentration of apo-A-1 which is the major protein component of HDL. Despite clarification of the role of lipids in CAD that such research provides, it has not been clearly shown how serum lipid profiles are related to the extent of CAD. There are some studies about the relationships of serum lipid measurments with the extent of coronary stenosis which had been determined by coronary angiography (5,6,7,8,9).

In this cross-sectional study, we assessed the association of lipid levels with the intraoperative findings of atherosclerotic changes in coronary vessels in patients undergoing CABG in Iran Day General Hospital.

MATERIALS AND METHODS

Patient Population

Subjects were selected from outpatients referred to our clinic by cardiologists from different parts of the country. All of them had angiographically documented CAD and had been undergone CABG at least 6 weeks before the visits for follow up after the operation.

Each patient was questioned by clinician regarding smoking habits, hypertension, diabetes mellitus and medication usage. We recorded for each patient in their clinic's files, the presence or absence of a history of hypertension requiring treatment, of diabetes, and of myocardial infarction. The presence or absence of a positive family history of premature CAD was also recorded.

Those who had suffered acute myocardial infarction within the previous 2 months, had current antihyperlipidemic medication, or had CABG less than previous 6 weeks excluded from the study. Thus, the present cross sectional study (from September 1996 to March 1997), was based on 152 patients with available data on medical evaluation, laboratory tests, and operation reports.

Determination of CAD Severity

The severity of coronaries involvement was determined under direct vision of a cardiac surgeon. During the operation, for each coronary branch, the local or diffuse involvement, it's diameter and it's run off (poor/good) after bypass were determined and recorded in the operation report.

Patient were divided into two major and distinct groups regarding data from their operation report:

1) Those with very severe and diffuse CAD that all their coronaries were diffusely diseased (n=30, 26 male and 4 female).

2) Those with less severe CAD that their involvement limited to certain coronary branches (n=80, 69 male and 11 female). The remainder 42 patients were excluded from these groups because they had history of hypertension, diabetes or had unclear surgery reports. None of our patients were current smoker and had stopped smoking for at least 1 year before the visit.

Lipid Analysis

Total cholesterol, HDL-C, LDL-C and TG levels were measured by the hospital's clinical chemistry department using standard enzymatic methods.

Statistical Analysis

This data were analyzed using InStat statistical package. Unpaired t-test and Fisher's exact test were carried out. InStat always test the assumption of equal variaces with an F test, and reports a P value test testing the null hypothesis that the two population have equal SDs. There were no significant difference in SDs in all of the comparisons.

RESULTS

Values of Mean ±SD of TC, LDL-C, HDL-C and TG levels in patients with very severe CAD and those with less severe CAD are presented in Table 1. Patients with all coronaries involvement had significantly higher mean LDL-C level than those with some coronaries involvement. (t-test, P<0.01). This group had also lower mean HDL-C and higher mean TC levels, but these differences were not statistically significant. There was no significant difference in TG levels between the groups.

Serum Lipid Measurement and Sex Differences

Of the 152 patients, 86% were male and 14% female with mean age at the time of CABG of 55 and 60 years, respectively. Females had significantly higher mean of age at the time of operation (t-test p<0.04). More than half of males had less than 55 years old (age of premature CAD) at the time of operation. Values of mean ± SD for TC, LDL-C, HDL-C and TG levels are presented in Table 2. Females had not quite significant higher mean HDL-C level (t test p<0.06), and significant higher mean TC level (t test, p<0.03) than males (Table 2). There were no significant differences in mean TG and LDL-C levels between male and female. Only 18% of patients had desirable LDL-C level (LDL-C<100 mg/dl). From other, 32% had LDL-C level between 100 and 130, 31% between 130 and 160 and, 18% of them had dangerous LDL-C level (LDL-C>160 mg/dl). Whereas more than half of our patients had normal TC levels (<200 mg/dl). There were no significant differences in various LDL-C ranges between two sexes.

There were a relatively high incidence of HDL-C deficiency (35%) and only 7% of our patients had desirable HDL-C level (HDL-C>60 mg/dl). Females had significantly higher incidence of HDL-C>60 mg/dl than males (Fisher's Exact test, p<0.0004). Five percent of males and 23% of females had HDL-C with negative risk factor role.

Table 1. Values of mean TC, LDL-C, HDL-C and TG levels (mg/dl)

Patient Groups	TC	LDL-C	HDL-C	TG
Group 1 all coronaries	220±45	142±45*	40±13	202±103
Groups 2 some coronaries	208±44	121±36*	43±17	204±92

Values are expressed as Mean ± SD.
* P < 0.01 (unpaired t-test).

Table 2. Values of mean TC, LDL-C, HDL-C and TG levels (mg/dl)

Patient Groups	TC	LDL-C	HDL-C	TG
Male (n=129)	208±3.7	127±3.3	40±1.2	194±8.4
Female (n=23)	229±10.9*	144±10.4	46±3.5**	220±25.2

Values are expressed as Mean ± SEM.
* P<0.03 (Unpaired t-test)
** P<0.06 (Unpaired t-test, not quite significaant)

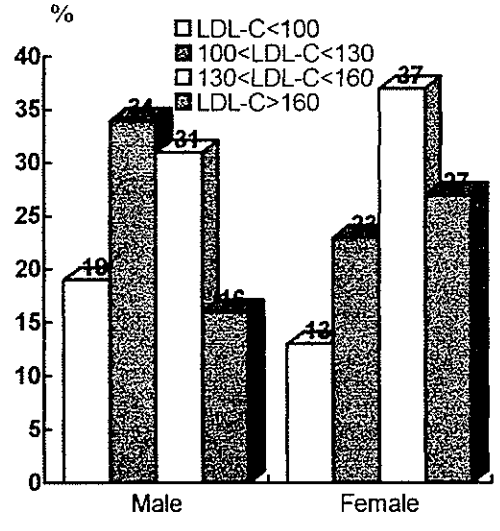

Fig. 1. LDL-C level (mg/dl), differences between males and females(%)

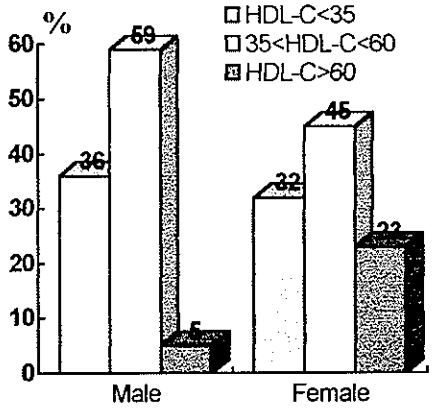

Fig. 2. HDL-C level (mg/dl), differences between males and females(%).

DISCUSSION

Since world war II, there has been a concentration of effort in developed countries to define factors associated with increased risk of CAD with the aim of implementing effective prevention. As recently reviewed, (10,11,12,13,14) it is known that increased levels of TC, LDL-C, apo-A_1, are associated with increased coronary risk; so are diabetes, hypertension, smoking and a positive family history of premature CAD. Prospective studies have correlated these factors with coronary events. (6,13,15)

However, few studies have examined the relation between these variable and the severity of CAD, as documented by its extent anatomically by coronary angiography. Results of these studies generally support the conclusion that there are independent relations of TC, LDL-C, HDL-C and possibly TG with the presence and extent of CAD that had determind by coronary angiography (7,9). However, our results are similar to these studies, but determination of severity and extent of CAD under direct vision during CABG, have the advantage of approach to more precise and direct findings for extent of CAD.

Another important aim of this study was assessment of lipid measurement in patients after CABG. We know that atherosclerosis frequently develops in saphenous-vein coronary bypass graft, leading to occlusion rates of 30 to 40 precent 10 to 12 years after surgery (16,17). This is especially common in patients with hyperlipidemia (18,19). The efficacy of lipid-lowering treatment in delaying the progression of atherosclerosis in native coronary arteries has been documented with coronary angiography (20,21). A recent multicentre study from the Post Coronary Artery Bypass Graft Trial Investigators (22) that carried out on 1351 patients after CABG revealded that aggressive lowering of LDL-C to below 100 reduced the progression of atherosclerosis in grafts. Unfortunately, only 18% of our patients had such desirable LDL-C. level, so careful control of lipids measurements especially LDL-C level after CABG is one of most important parts of therapy and this goal (LDL<100 mg/dl) should be more attended.

In conclusion results of this study revealded that patients with higher level of LDL-C, had more severe and diffuse involvement in their coronaries that determined under direct vision during CABG. Most of our patients had high levels of LDL-C and this problem lead to early occlusion of bypass grafts. However, this is a retrospective cross-sectional study, and this problem definitely confound our results. So a careful controlled prospective study is recomended. Such study is already in progress. Thus, treatment of hyperlipidemia is most important and necessary part of therapy after CABG. This treatment leads to graft's patency, prevents from reoperation and progression of CAD.

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