SHORT REPORT

Cholesterol and long-term mortality after acute myocardial infarction in elderly patients

MARIO BO, UMBERTO FIANDRA, GIANFRANCO FONTE, MARCO BOBBIO1, FABRIZIO FABRIS

Institute of Geriatric Medicine and Surgery, University of Turin, Italy
1Institute of Cardiovascular Medicine and Surgery, University of Turin, Italy

Address correspondence to: M. Bo, Istituto di Geriatria, Azienda Ospedaliera San Giovanni Battista, C. so Bramante 88, 10126 Torino, Italy. Fax: (+39) 11 6961045

Abstract

Method: we investigated the association of total serum cholesterol concentrations and subsequent overall and coronary mortality in 304 patients aged ≥65 discharged from hospital after acute myocardial infarction.

Results: there was no association between total cholesterol concentrations and mortality due to either coronary heart disease or to all causes in all patients or, separately, in men, women, patients younger than 75 and patients aged 75 years and older.

Keywords: acute myocardial infarction, cholesterol, coronary heart disease, mortality

Introduction

Statins are beneficial and safe in lowering serum cholesterol concentrations in normo- and hypercholesterolaemic patients after a myocardial infarction [1–3]. However, the relevance of hypercholesterolaemia as a risk factor for total and cardiovascular mortality in older patients is controversial [4–8]. We investigated the association of total serum cholesterol concentrations and subsequent overall and coronary mortality in patients aged ≥65 with acute myocardial infarction.

Methods

We studied 304 patients aged ≥65 years (192 men, 112 women; mean age 73.3 ± 5.7 year) consecutively discharged from the San Giovanni Battista Hospital between 1988 and 1991 with a primary diagnosis of acute myocardial infarction [code 410 according to the International Classification of Diseases (ICD)-C]. All medical records of the study population were individually reviewed and validated to meet the inclusion criteria of serial electrocardiographic findings consistent with acute myocardial infarction and marked (>200 IU/l) creatinine kinase elevation. Both criteria had to be satisfied for inclusion to the study. For each subject, date and cause of death according to ICD code were obtained from the Turin registration office in December 1995.

Clinical data from the validated medical records were collected on a form with five sections: medical history; physical signs at entry; ECG findings; laboratory investigations and diagnostic procedures; and hospital course, including complications and treatment. A more detailed description of our methods has been published elsewhere [9].

Sex-specific univariate analysis was performed using the Cox proportional hazards model to evaluate the odds ratio with 95% confidence intervals for each covariate, according to the equation \( \ln \left( \frac{E}{t} \right) = a + x \beta \), where \( E \) = event of interest, \( t \) = time interval, \( a \) = constant, \( x \) = covariate and \( \beta \) = coefficient. Predictive variables were then introduced into a Cox forward stepwise model. Events of interest considered were all-cause mortality and coronary heart disease (CHD) mortality (ICD codes 410–414). After evaluation of all patients, the same procedures were used to evaluate patients aged less than 75 years and those aged 75 and over. Total cholesterol concentration was evaluated as a continuous variable, as a dichotomous variable (< and ≥6.25 mmol/l) and through analysis according to the 'dummy variables' model. Cumulative survival curves
and CHD survival curves, by cholesterol quartiles and in normo- and hypercholesterolaemic patients, were calculated using the Lee–Desu statistical method.

Results

At the end of 1995, 198 subjects (69 women and 129 men) had died, 90 (29.6%) with ischaemic heart disease. Mean survival time was 1758.1 ± 115.8 days (1844.6 ± 111.4 in women and 1707.1 ± 120.7 in men). At the time of infarction, 242 patients (79.6%) had cholesterol concentrations below 6.25 mmol/l, and the average cholesterol concentration in the study population was studied was 5.29 ± 1.21 mmol/l. No association between increasing total cholesterol concentrations and mortality due to either CHD or to all causes was observed (Table 1). Cumulative and CHD survival curves did not show any predictive value of cholesterol for mortality in men and women and, separately, in patients younger than 75 and 75 years and older. Age (P < 0.001) and occurrence of ventricular arrhythmias (P < 0.05) in men, Killip class at entry (P < 0.001) and non-use of antiplatelet drugs (P < 0.05) in women, were independent predictors of long-term mortality.

These results indicate that in an elderly Mediterranean population discharged from hospital after a myocardial infarction, total cholesterol concentrations are not associated with increased mortality due to CHD or to all causes. The lack of association between total cholesterol level and CHD mortality is unexpected and needs some explanation. The mean age of our study sample was high; other studies of very elderly cohorts that included men and women without CHD support our findings [7, 8]. Also, the cholesterol concentration of aged subjects might not represent their lifetime exposure and, thus, not effectively stratify their risk. As a result of selective survival, very old hypercholesterolaemic patients could be relatively resistant to the effects of lipids, and ageing might be associated with a decreased susceptibility of the arterial wall to cholesterol concentrations in the blood. Also, the relatively narrow range of cholesterol values in our patients (which reflects the unselected consecutive nature of the sample) may reduce the ability to detect the impact of markedly elevated cholesterol concentrations on mortality in aged patients. Moreover, elderly patients have a high non-cardiac mortality, which could dilute the effects of cholesterol and other conventional risk factors for cardiac mortality.

Although the association between cholesterol and mortality could be attenuated if serum cholesterol is measured too soon after infarction [10], most evidence [11–13] suggests that lipids may be accurately assessed during the first 24–48 h after acute myocardial infarction. Because high- and low-density lipoprotein cholesterol values were not available for all patients, our study could not investigate the predictive role of these components, which may represent important CHD risk predictors in older patients [5, 14, 15].

The inclusion of patients consecutively admitted to hospital, rather than selected patients, may have reduced selection bias. Although the investigation period was some time ago, it is unlikely that secular changes over this time in the medical treatment of acute myocardial infarction will have affected the primary outcome. This study is one of the largest to investigate the association of cholesterol and CHD mortality in elderly and very elderly patients who recovered from acute myocardial infarction; our CHD mortality cases were derived from death certificates, but it is unlikely that misclassification may have introduced systematic bias into the study.

Two further limitations must be considered. First, we do not have information about patients’ lifestyle changes after discharge—e.g. physical activity—which could affect mortality. Secondly, this retrospective study depends on accurate recording of clinical variables; the severe inclusion criteria make it unlikely that inaccurate medical recording may have introduced bias. Larger studies are needed to corroborate our findings and to investigate the effects of statins on mortality and morbidity in older people.

Table 1. Total and coronary heart disease (CHD) mortality for cholesterol quartiles and in normo- and hypercholesterolaemia (Lee–Desu survival analysis)

<table>
<thead>
<tr>
<th>No. (and %) by total cholesterol, mmol/l</th>
<th>Normo/hypercholesterolaemia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quartiles</strong></td>
<td>&lt;6.25</td>
</tr>
<tr>
<td>&lt;4.44</td>
<td>52 (67.5)</td>
</tr>
<tr>
<td>4.44–5.08</td>
<td>23 (29.9)</td>
</tr>
</tbody>
</table>

$^6P$ was not significant for either all-cause or CHD mortality.

B. Mario et al.

Key points

- Patients aged ≥65 with acute myocardial infarction showed no association between total cholesterol

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concentrations and mortality due to either coronary heart disease or to all causes.

- The lack of association persisted when men and women, and patients younger than or older than 75 were considered separately.
- Age and occurrence of ventricular arrhythmias in men, and Killip class at entry and non-use of antiplatelet drugs in women were independent predictors of long-term mortality.

References


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