and Switzerland lie considerably below the regression line and, on the other hand, the United States much above it. As, however, CHD is a multifactorial disease for which the consumption of dairy fats or, more generally, saturated fats is not the sole risk factor, some irregularities are to be expected. Furthermore, the unavoidable inaccuracies in the statistical data emanating from various countries may be responsible for part of the scatter. In view of all this, the correlation shown in figure 4 is remarkably good ($r = 0.75$).

The correlations alone, of course, can never establish causation. They can, however, and often do suggest hypotheses, which then can be tested by other methods. This has been in the case of the lipid hypothesis, which has evolved into a well-supported theory with important clinical and public health implications.

Dr. Oster's suggestion that bovine milk xanthine oxidase could be etiologically related to atherosclerosis, and hence also to CHD, is interesting, but highly hypothetical. To be taken seriously, it would need much more supporting evidence, preferably also from some kind of human intervention trials.

Osmo Turpeinen, M.D.
Department of Biochemistry
Hämeentie 57
00550 Helsinki 55, Finland

Predicting Survival in CAD

To the Editor:

In the first of two companion papers in the March 1979 issue of Circulation, Hammermeister et al. identify variables predictive of survival in patients with coronary artery disease. Univariate and multivariate techniques revealed that the state of left ventricular function, as measured by the ejection fraction, best predicted survival at 2 years. Interestingly, the number of vessels diseased, per se, had only a small additional prognostic effect. These results support conclusions that we have previously made from similar multivariate testing of nine clinical and catheterization prognostic variables.

In view of the first paper's results, we are surprised that in the second paper six much weight is accorded to the number of vessels diseased. We believe that considerable confusion has resulted from comparing patients on the basis of vessels diseased when, in fact, to define prognostically homogeneous strata, the ejection fraction was selected as the most important variable in both the Seattle study and also in our earlier study. In attempting to define subgroups most likely to show survival benefit from surgery, a stratification using the strongest survival predictor would be preferable. The authors did use categories of ejection fraction in the matching of surgical and medical patients. However, in the final analysis, they chose to stratify not on ejection fraction, but on the number of vessels diseased, a variable with considerably less predictive value.

Using the best survival predictor in our own study, the left ventricular ejection fraction, as the basis for prognostic stratification, we cannot see a benefit of surgery in prolonging life when the ejection fraction was $\geq 50\%$ or $<25\%$. Our latest follow-up data indicate that the probability of surviving 7 years in patients with an ejection fraction $\geq 50\%$ is $83\%$ for medically treated patients and $88\%$ for surgically treated patients. In contrast, for patients with ejection fractions of 25-49\% a marked difference in survival is seen with 5-year survival probabilities of 55\% in the medically treated group and 85\% in those treated surgically.

The papers by Hammermeister et al. emphasize the importance of left ventricular function in determining survival in patients with coronary artery disease, but further detailed analysis of its possible role in treatment selection is not presented. Are the authors wise to lump all two-vessel disease patients with an ejection fraction of $\geq 30\%$ together when making recommendations regarding therapy?

Ronald E. Vlietstra, M.D.
Robert L. Frye, M.D.
Lila R. Elveback, Ph.D.
Mayo Clinic and Foundation
Rochester, Minnesota 55901

References


The author replies:

To the Editor:

While we have no disagreement with Vlietstra and co-workers regarding the prime importance of ejection fraction as a prognostic variable, we feel that extent of coronary disease is an important and widely used clinical tool in making both prognostic statements and therapeutic decisions regarding patients. This is supported by the fact that virtually all other publications on this topic have used this variable to classify patients, demonstrate excellent prognosis in patients with single-vessel disease, and show no difference in survival between medical and surgical treatment in patients with single-vessel disease.

We agree with Vlietstra et al. that it is the subgroup with moderate reduction in ejection fraction that is most likely to have improved survival with surgery when the follow-up observation is relatively short (2-4 years). In our previous publication, the largest difference in survival between medically and surgically treated groups was in patients with two-vessel disease and ejection fraction of 31-50\%. This is only logical, since patients with normal ejection fraction generally have good short-term survival, so no treatment effect would be discernible, and patients with very low ejection fraction have poor prognosis regardless of treatment. This is not to say that surgically treated patients with normal ejection fraction and two- or three-vessel disease won’t have improved survival with longer follow-up of 5 years or longer.

In the present report under discussion, we analyzed survival among the matched pairs subgrouped by ejection fraction, but didn’t report it due to space limitations. For patients with two-vessel disease, surgically treated patients with normal ejection fraction (≥51\%) had better survival than similar medically treated patients (n = 67 pairs; p = 0.011). Also, in patients with two-vessel disease, surgically treated patients with moderate reduction in ejection fraction had better survival than similar medically treated patients (n = 28 pairs; p = 0.017). For patients with three-vessel disease, surgically treated patients with moderate reduction in ejection fraction had better survival than similar medically treated patients (n = 23 pairs; p = 0.012). There was no difference in survival between medically and surgically treated patients with three-vessel disease and normal ejection fraction due to high operative mortality.

K. E. HAMMERMEISTER, M.D.
TIMOTHY A. DEROUEN, PH.D.
HAROLD T. DODGE, M.D.
Veterans Administration Medical Center
and University of Washington
Seattle, Washington

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R E Vlietstra, R L Frye and L R Elveback

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