Natural history of coronary artery disease proved by coronary arteriography

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Since coronary arteriography represents the most accurate diagnostic parameter in the evaluation of coronary artery disease, it is only logical that we should try to determine the value of angiographic data in studying the natural history of coronary artery disease.

Basically two major approaches are possible. First, the clinical evolution (in particular survival) can be studied in relation to angiographic data using the date of catheterization as the zero time. Preferably, such studies should be multifactorial, including all available data that may be of prognostic value. Second, we can study the anatomical evolution of coronary artery angiography two or more times. As "natural history" is usually defined as the history without surgical intervention, patients who have undergone coronary surgery should be excluded from these studies.

We review the major findings of two studies using survival after coronary arteriography and anatomical evolution as demonstrated by sequential angiographic analyses as the primary focus of interest.

The first reported study, concerns a 10-year follow-up of 601 patients studied at the Cleveland Clinic.[1] Patients having obstructions of a single major coronary artery had a high survival rate for the first 4 years (2.4% cardiac mortality per year),

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but a less favorable prognosis afterwards (5.2% mortality per year). Survival was higher in patients with obstruction of the right coronary artery than in those with obstruction of either the circumflex or left anterior descending artery.

Ten-year survival in patients having obstructions of two or three arteries was 45.4% and 23.6%, respectively. Survival of patients having obstruction of the left main coronary artery was almost the same as in the three-vessel disease group. The left ventricular angiogram appeared to have considerable prognostic value, which was in part unrelated to the arteriographic findings.

A subset of patients who would be considered candidates for revascularization by current criteria showed the same trends, but survival was slightly higher than in the total number of patients, mainly because patients with very poor left ventricular function were excluded.

Of the other parameters studied, only the electrocardiogram and, to a lesser extent, the presence of hypertension and diabetes were of prognostic significance.

The second study comprised a group of 256 patients who twice underwent coronary angiography at the St. Antonius Hospital, Utrecht. More than half of these patients were restudied within 2 years after the first catheterization. The reason for this is that waiting lists for surgery in Holland have been very long for patients in a stable condition, and that angiograms performed more than 10 months before the date of operation were not representative of the current situation.

This provides us with a series of patients in whom recatheterization otherwise would be difficult to justify. The coronary arteriograms were coded in maximally 21 segments per patient.

First, the behavior of separate segments was studied. Unaffected segments rarely showed development of significant lesions (3.1% after 3 or more years).

In the other categories, progression rate rose as a function of severity of initial lesions and time, ranging from 3.4% in segments with slight abnormalities and an interval of less than 1.5 years to 20.5% in segments > 50% narrowed and an interval of 3 years or more. The proximal right coronary artery, the left anterior descending artery distal to the origin of the first septal perforator and first diagonal branch, and the obtuse marginal branch of the circumflex artery showed the highest progression rate.

In groups of patients, the most important single determinant of progression was time. The progression rate in patients who were restudied within a year was 40% and the frequency of progression gradually increased to 92% in patients who were studied after 5 years. Progression was higher in patients with two- or three-vessel disease than in those with single-vessel involvement. In 40% of the patients demonstrating progression, this occurred only in segments that were less than 50% narrowed at the first study, in 29% it occurred in segments narrowed 50% or more, and in 31% it occurred in both categories.

To determine the practical importance of these findings we have tried to answer the question of whether more grafts would be necessary to achieve complete revascularization on the basis of the second angiogram as compared

Table. Interval between studies

Surgical procedure	0–18 mo	19–36 mo	37+ mo
Unchanged	93	25	21
More grafts necessary	21	21	35
Left ventricle deteriorated	16	10	14

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with the first study and whether left ventricular contractions had deteriorated to such an extent that the possible benefit of surgery had decreased. This yielded the results shown in the *Table*. From these two studies it appears that coronary artery disease is an accelerating process. When the severity of arterial involvement increases, mortality and progression rate rise.

Reference

1. Proudfit WL, Bruschke AVG, Sones FM Jr: Natural history of obstructive coronary artery disease; ten-year study of 601 nonsurgical cases. *Prog Cardiovasc Dis* **21:** 53–78, 1978.

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