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Christian F. Borchgrevink

### Abstract

Coronary heart disease expresses itself usually as angina pectoris or myocardial infarction. At least in Norway, angina pectoris is the more common form, particularly in people under the age of 65. The vast majority of patients with myocardial infarction is admitted to hospitals while the majority of patients with angina pectoris as the sole expression of coronary heart disease seeks a general practitioner if he sees a doctor at all. Therefore the incidence of angina pectoris in the population is less well known, than the incidence of myocardial infarction and consequently the exact prognosis is hard to give.

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# PROGNOSIS OF ANGINA PECTORIS

**Christian F. Borchgrevink**

*From: Department VII, Ullevål sykehus Head: Professor dr. med. Einar M. Blegen*

Coronary heart disease expresses itself usually as angina pectoris or myocardial infarction. At least in Norway, angina pectoris is the more common form, particularly in people under the age of 65. The vast majority of patients with myocardial infarction is admitted to hospitals while the majority of patients with angina pectoris as the sole expression of coronary heart disease seeks a general practitioner if he sees a doctor at all. Therefore the incidence of angina pectoris in the population is less well known, than the incidence of myocardial infarction and consequently the exact prognosis is hard to give.

The large American studies on the prognosis of angina pectoris include a high percentage of patients who have experienced one or more infarctions, who have developed heart failure or who have cardiac enlargement. The prognosis in such patients is therefore unlikely to be the same as in patients with, so far, uncomplicated angina pectoris.

Although sudden death or an acute infarction will always hang as a Damocles sword over the heads of patients with angina pectoris (as it actually does over the heads of all of us) the prognosis is probably not as grave as generally accepted 30 years ago. Paul D. White states in one of his many papers that the average survival was thought to be less than 5 years. Such figures were usually derived from autopsy data. Zoll *et al.* (1951) found among 177 autopsied patients with angina pectoris that  $\frac{1}{3}$  had died within one year after start of symptoms, 50 per cent within 2 years, 75 per cent within 5 years and 90 per cent within 10 years. To me such figures only show that some patients die soon after developing angina pectoris and that some patients live for a long time. But as we do not know the number of living patients with angina, the figures tell very little about the exact prognosis.

As the results of the long-term studies, mainly from America, appeared, it was clearly shown that the prognosis although still grave, was at least somewhat brighter than generally felt. In 1943 White *et al.* published their experience with 500 patients with angina pectoris, followed for almost 20 years, and in 1956 Richard *et al.* published a follow-up study. This is a remarkable study as all patients were traced, the same can unfortunately not be said about the other large American studies. The survival curve is shown in Figure 1. Half of the patients were dead  $8\frac{1}{2}$  years after diagnosis was made. Some patients were still alive 30 years after diagnosis. Only 20 per cent of the patients had normal cardiac status at the time of diagnosis, and they showed a better prognosis as the group as a whole, a point I shall return to. 76 per cent of all the deaths were cardiac.

The largest study was published by Block *et al.* in 1952. Almost 7,000 patients were followed from 5 to 23 years. The average duration of angina pectoris prior to diagnosis was  $2\frac{1}{2}$  years and 25 per cent of the patients had experienced previous infarction.

Figure 2 shows the survival curve of the patients together with the corresponding curve of the normal population. It will be seen that there was a distinct higher mortality the first year after diagnosis. The 5 and 10 years' survival were 58.4 and 37.1 per cent respectively against 86.9 and 70.4 in the normal population. Almost 20 per cent of the patients could not be traced after 10 years.

Table 1 on page 56 shows that the survival rate falls with age. However, when adjusted for normal death, the effect of angina survival is the same in all on age groups. A similar observation was made by White *et al.*, i.e. that the excess mortality of patients with angina pectoris measured in numbers of lives is independent of age.

The study of Block *et al.* gives detailed information

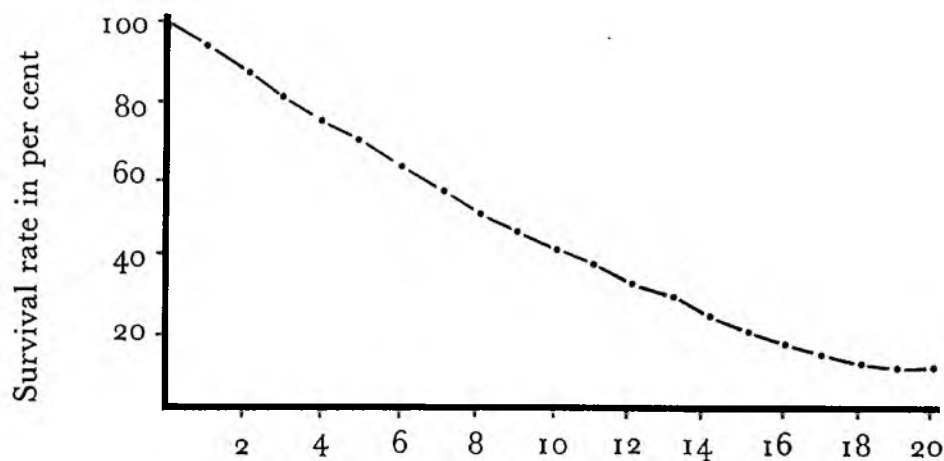


FIG. 1 Years after diagnosis (White *et al.* 1943)

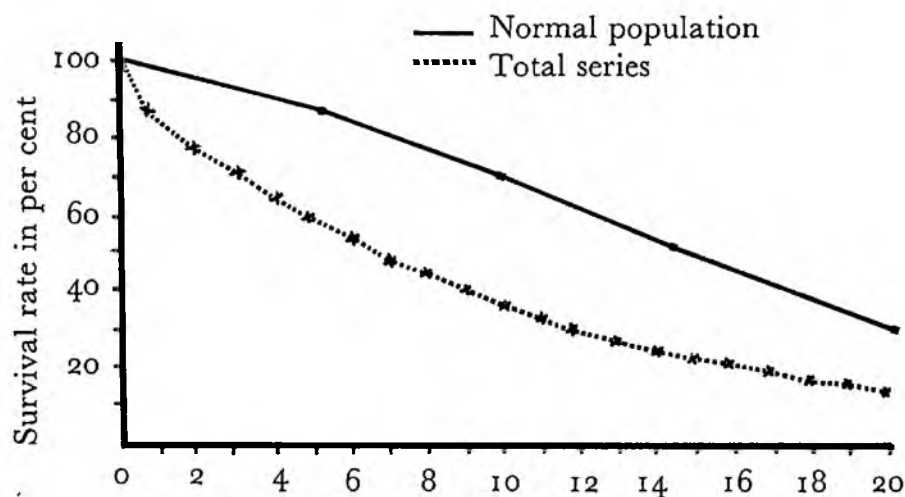


FIG. 2 Years after diagnosis (Block *et al.* 1952)

on factors influencing the prognosis as shown in Table 2. Patients with hypertension, abnormal ECG, cardiac enlargement or previous myocardial infarction have a more serious prognosis while angina pectoris connected with obesitas showed a better prognosis. They also made the observa-

tion that angina pectoris connected with malignant disease showed a poor prognosis, a statement I do not find unreasonable. This multifactorial influence on prognosis makes prognostic comparison from one series to another very difficult and almost meaningless, particularly when

Table 1

Age (Years)	Survival Rate in %			
	5 years Adjusted for Normal Death		10 years Adjusted for Normal Death	
<40	66	68	47	50
40-49	65	69	43	49
50-59	61	68	37	48
60-69	55	69	29	51
70-79	43	72	16	62

(Block *et al.* 1952)

Table 2

	Survival Rate In %	
	5 Years	10 Years
Total Series	58	33
Previous Infarction	46	26
Abnormal ECG	43	23
Cardiac Hypertrophy	41	20
Heart Failure	20	8
Hypertension, Group 3	22	1.3
No Cardiac Hypertrophy	64	39
Normal Blood Pressure	63	40

(Block *et al.* 1952)

evaluating effects of drugs on the long-term prognosis. This situation is similar to the one we are facing after myocardial infarction, which was clearly pointed out by our Chairman some years ago.

In 1960, Seim, from Norway, studied the prognosis of angina pectoris in 600 patients followed for 5 to 25 years. 99 per cent could be traced. The 5 and 10 years' survival was about 70 and 50 per cent, respectively slightly better than in Block's material. Figure 3 on page 57 shows that females have a better prognosis than males. Patients with normal ECG have a much better prognosis than patients with abnormal ECG, the 5 years' mortality being about 22 and 45 per cent respectively.

The problem of remission has been attacked by Riseman (1966), who has followed 122 patients with angina pectoris weekly for 6 months to 16½ years. More than half the patients showed remissions, defined as 2 months or more without pain. Half of these were free from pain for more than one year. In half the patients the remission

was spontaneous. 20 per cent of the patients had periods with exacerbations. It was impossible to beforehand to tell whether a patient would experience a remission or an exacerbation.

Life Insurance Companies' Institute for Medical Statistics at Oslo City Hospitals has made a study of 331 patients with angina pectoris without infarction. The majority attended an out-patient clinic, and the others had been admitted to medical departments. Table 3 shows the ratio of observed/expected deaths. This ratio falls with age which may be interpreted to mean that angina pectoris is more serious in young patients. However, if take the difference in the numbers of deaths between patients and the normal population there is actually very little difference between the age groups, confirming Block *et al.*'s and Richard *et al.*'s findings that the excess mortality in angina pectoris expressed as the number of deaths is independent of age.

Table 3

Age (Years)	Number of Deaths	
	Observed/ Expected	Difference Between Patients and Population (per 1000)
35-54	5.5	30
55-69	2.3	34
>70	1.4	37

There seems to be little difference in the ratio whether the angina lasted a short or a long time before registration (Table 4). The duration of the observation period seems also to have little influence on the excess mortality (Table 5) on page 58. This is in contrast to the result of Block *et al.* who found a higher mortality in the first year. The discrepancy may perhaps be explained by Table 6 on page 58, which clearly shows a higher mortality the first year after myocardial infarction. 25 per cent of Block's patients had

Table 4

Duration of Angina Prior to Registration	Number of Deaths Observed/Expected
<6 Months	1.6
6-12 Months	2.2
1-2 Years	1.5
2-5 Years	2.9
>5 Years	2.8

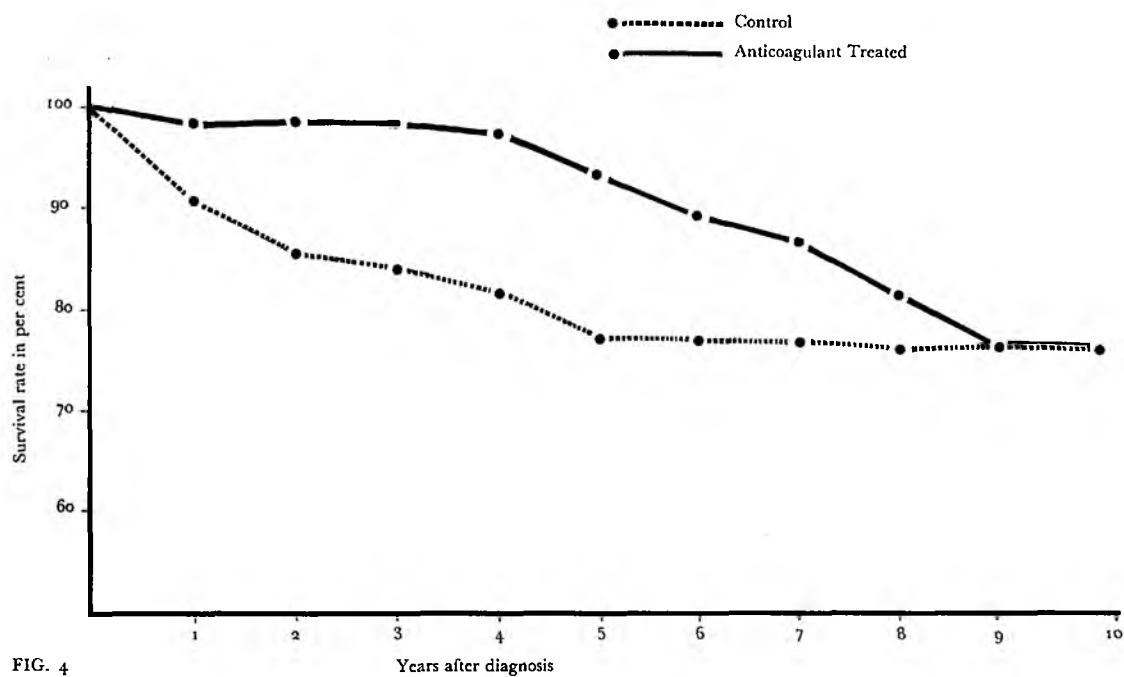
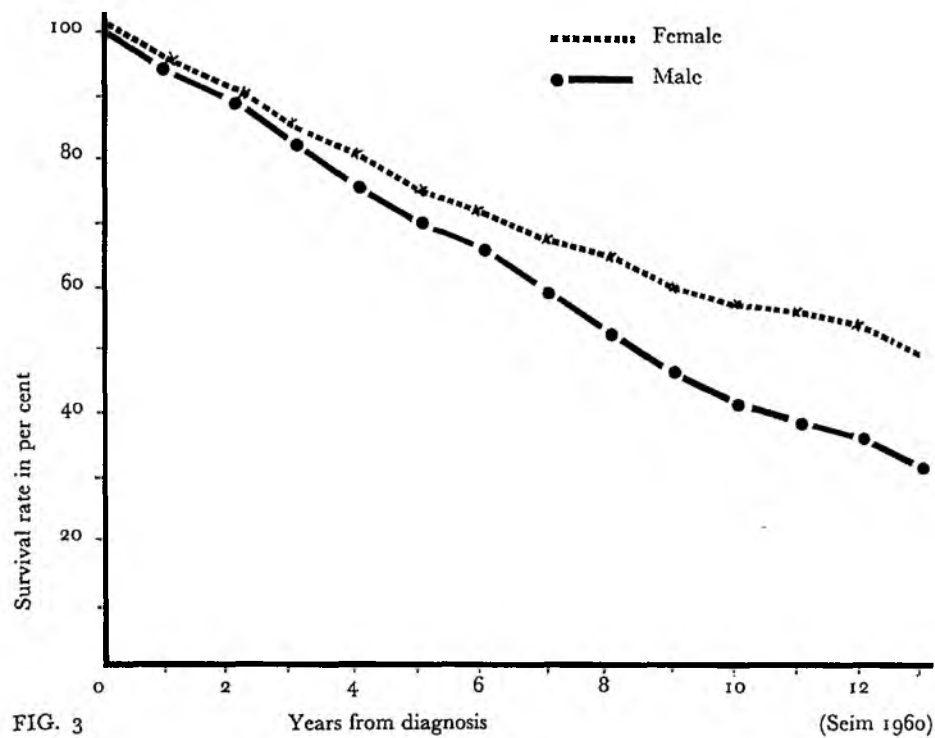


Table 5

Obs. Period	Number of Deaths Observed/Expected
<6 months	2.1
6-12 months	2.4
1-5 years	2.3
>5 years	1.8

Table 6

Age (Years)	No. of Deaths - Observed/Expected		
	Years after discharge from hospital		
	1	2-5	>5
30-49	10.6	7.2	4.5
50-64	6.0	3.4	2.8

#### Patients with Myocardial Infarction

experienced infarction, and this fact may explain the high mortality in first year.

Table 7 shows that there was, perhaps surprisingly, no difference in prognosis between the patients with moderate or severe angina pectoris as White *et al.* have also pointed out.

By carefully reading the patients' history it turned out that the majority of the patients had angina on exertion while the minority did not, although they still got a diagnosis of angina pectoris.

Table 7

Angina	Number of Deaths Observed/Expected
Severe	2.2
Moderate	2.0

Table 8 shows that only angina on exertion is correlated with excess mortality while the patients with diagnosed angina pectoris without this symptom actually seemed to have a mortality lower than normal, indicating most likely that they did in fact not have coronary heart disease.

Table 8

Angina on Exertion	Number of Deaths Observed/Expected
Yes	2.6
No	0.5

The serum cholesterol level is a well known predictor of myocardial infarction in normal persons, and Table 9 shows that this holds true also for patients with angina pectoris.

Table 9

Cholesterol (MG%)	Incidence (3 years) of Myocardial Infarction	
	No Angina Pectoris	With Angina Pectoris
<249	0.8	4.9
250-299	1.9	8.1
>300	3.0	20.8

Westlund & Nicolaysen 1966

May medical or surgical treatment influence the prognosis in patients with angina pectoris? As far as I know, there has been no dietary study on such patients. But recent experience in Norway where a strict cholesterol lowering diet reduced the rate of re-infarction in male survivors of acute infarction, makes it likely that such diet also would be of benefit to patients with angina pectoris.

Most of the drugs used in the treatment of angina pectoris are aimed at curing or preventing the anginal attack. Even if this goal is achieved we do not know whether these drugs actually prolong the life of the patients, as no large long-term study exists.

Several authors have reported on the long-term effect of surgical treatment. Hallen (1964) followed 90 patients employing the method of Beck, for 2½ years. The annual mortality was 7 per cent which does not permit any conclusion. Brofman (1960) observed 110 patients for 3-5 years, of whom 75 per cent survived 5 years. He compared his results with the study of Block *et al.* who found a 5 year survival rate of 58.4 per cent and concluded that his patients had benefited from the operation, a conclusion hard to accept because of lack of information on the similarity of the two groups.

It is difficult for me to discuss the prognosis of angina pectoris without mentioning the possible beneficial effect of long-term anticoagulant therapy. In 1957 we randomized patients with angina pectoris without infarction with normal blood pressure and heart size, into an anticoagulant group and a control group. After 18 months

one death has occurred in the treated group against 9 in the control group, a difference statistically significant at the 1 per cent level. I made a follow-up study last month and the Figure 4 shows the result. All patients are traced and followed for a minimum of  $7\frac{1}{2}$  years and a maximum of  $9\frac{1}{2}$  years or until death. 80 per cent of the survivors are still on anticoagulant therapy. The 5 year survival in the anticoagulant treated group was 93.2 per cent, which is definitely higher than in any report in the literature and statistically significantly higher than in the control group where the survival was 77 per cent. Beyond the first years the interpretation of the curves is difficult and comparison between them is of little meaning. Anticoagulant therapy was started in the control group  $1\frac{1}{2}$  to 2 years after the start of the study as we did not feel justified in withholding this therapy from the patients. The 10 year survival rate was the same in the two groups (75 per cent) but now we have no control group for comparison. I would guess that Mr. Chairman would disagree with me, but I still think that the most likely interpretation of these results is that anticoagulant therapy is of value in patients with angina pectoris when given within a year after the first symptoms.

#### *Conclusion*

How is one to conclude? The prognosis of angina pectoris is as unpredictable as life itself. Some patients die soon after their first attack, some go on living almost for ever. It is extremely difficult if not impossible to give an exact prognosis in the individual patient, but as a group it is probably fair to say that they have roughly a 50 per cent chance of surviving for 10 years. If they already have experienced a myocardial infarction, if they have hypertension, cardiac enlargement or abnormal ECG the prognosis is poorer. If they have no complication to their angina their chances of surviving for 10 years are probably about 75 per cent. The prognosis is independent of age, and severity and duration of the symptoms. It is better when the angina is combined with anaemia, obesitas or thyreotoxicosis, while it is worse when it is combined with valvular heart disease. On the whole the prognosis of angina pectoris is similar to the prognosis of survivors of myocardial infarction.

The majority of the patients have had angina pectoris for several years before the diagnosis was made. If we had been able to register the patients

from their first symptom this might have influenced the prognosis. It is, however, difficult to say in which way.

It is not impossible that cholesterol lowering diet and/or intensive anticoagulant therapy may improve the prognosis in patients with angina pectoris.