staff were seeing the number expected. It was also observed that non-smokers seemed firm in their intention not to smoke. Such intentions may be misleading. Only 6% of children think they will be regular smokers when they leave school,² but if current rates reported in the general household survey continue as many as 37% will be regular smokers by their early 20s. At these rates one in three teenagers stating an intention not to smoke is likely to become a regular smoker within the next few years. There is clearly much to be done to strengthen and reinforce the early intention not to become a smoker, and this study suggests that most adolescents would welcome such an initiative from general practice.

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Elderly and younger patients selected to undergo coronary angiography

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Abstract

Objective—To establish and compare the characteristics of older (≥ 70 years) and younger patients with chest pain selected to undergo coronary angiography and by analysis of their subsequent management to assess the value of coronary angiography for older patients with chest pain.

Design—Retrospective analysis of clinical case notes and coronary angiography reports.

Setting—Cardiology department with referral population of one million in an Edinburgh hospital.

Patients—134 consecutive patients with chest pain aged 70 years or over investigated by coronary angiography between 1978 and 1988; 134 randomly selected patients aged under 70 investigated over the same period.

Main outcome measures—Clinical and angiographic features at time of angiography and management after angiography.

Results—Older patients represented a small, but increasing, proportion of those investigated. Older patients had more severe symptoms at the time of angiography, were taking more antianginal drugs, and had had their symptoms for longer than younger patients. At angiography more older patients had triple vessel coronary disease, left main stem stenosis, or left ventricular impairment. After angiography similar proportions of older and younger patients underwent coronary artery surgery, with

more elderly patients requiring urgent operation; although operative mortality was higher for elderly patients, symptomatic benefit was similar to that in younger patients.

Conclusions—Older patients with angina selected to undergo coronary angiography and subsequent coronary surgery have more severe symptoms and underlying cardiac disease. Earlier referral and investigation might yield a population with lower operative risk. Selection of patients for coronary angiography and coronary artery surgery should be based on the potential for benefit and should avoid "agism."

Introduction

The number of elderly people in the United Kingdom has risen progressively and there has been an associated increase in the prevalence of age related conditions such as angina pectoris. Although cardiology departments have consequently experienced an increase in the number of elderly patients referred for investigation of coronary artery disease, such patients still represent only a small proportion of the total number undergoing coronary angiography. To assess the value of coronary angiography in elderly patients with angina we reviewed the angiographic findings and clinical features and outcome of patients aged 70 years or more who had coronary angiography during 1978-88

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and compared the results with those of younger patients investigated during the same period.

Patients and methods

The cardiac laboratory record books for the 11 year period 1978-88 were reviewed. During this period 134 patients age 70 years or over (median 72.8 (range 70-85) years) had undergone coronary angiography for investigation of chest pain. Patients with valve or congenital heart disease, cardiomyopathy, and previous bypass surgery were not included. A total of 134 patients aged under 70 years (median 51.7 (range 32-68) years) undergoing coronary angiography were selected from the same source by a random method that allowed the annual number of patients in each group to be matched. The case notes and angiographic data of all 268 patients were then reviewed, analysed, and compared and additional follow up data were obtained from general practitioners when necessary.

Significant stenosis was defined as a reduction of the luminal diameter of a coronary artery of 50% or more. Left ventricular function was graded as good, moderate, or poor by left ventricular angiography.

Means were recorded with their standard errors, medians with their 95% confidence intervals. The comparison of proportions between the two groups was based on the χ^2 test, with the test for trend where appropriate, and calculation of the associated p value. A p value <0.05 was considered significant. Additionally, the 95% confidence intervals for the difference between proportions, when expressed as percentages, are shown.

Results

Table I shows the annual number of patients aged ≥ 70 years undergoing coronary angiography during 1978-88. The number of elderly patients having

coronary angiography during the final five years of this period was 12 times greater than in the first five years; because the total number of coronary angiograms performed rose from 150 in 1978 to 720 in 1988, after patients with associated valve or congenital heart disease had been excluded, the contribution of elderly patients to the total coronary angiogram caseload increased by under four times, from 1.3% to 4.6%. Patients can be referred to our department either directly from local general practitioners or from general physicians in our hospital or several other referring hospitals, so it is not possible to determine how many elderly individuals with persistent chest discomfort were not referred or were referred but not investigated. As the prevalence of angina in elderly people is 10%,¹ and about 10% of our referral population is aged 70 or over, we believe that those investigated during this period represent a small minority of our elderly population with angina. The referral population of approximately one million remained stable during the period studied and the waiting list for non-urgent coronary angiography never exceeded three months. The waiting list for elective coronary surgery was, however, up to a year.

CLINICAL CHARACTERISTICS

Table II shows the clinical characteristics of the elderly and younger patients. Although we reviewed a relatively small proportion of younger patients, their characteristics are comparable to those of younger patients undergoing angiography in larger North American series² and we therefore believe are representative of our younger patients in general. There was a noticeable difference in the sex ratio of the two groups, with 59 women in the elderly group (44%) and 31 in the younger group (23%). Fewer of the elderly patients were smokers and fewer were obese (body mass index >25 kg/m²). A similar number in each group had a history of hypertension. Peripheral vascular disease (defined as a history of intermittent claudication) and previous myocardial infarction (defined by standard electrocardiographic criteria or documented at hospital admission) were significantly more common in the elderly patients, but cerebrovascular disease (defined as a history of transient ischaemic attacks or stroke) was not. The elderly patients had had angina for much longer before angiography (median 36 (95% confidence interval 30 to 96) months, compared with the younger patients (12 (9 to 18) months; 95% confidence interval for difference 6 to 30 months). A substantially greater proportion of the elderly patients were in the more severe New York Heart Association symptom classes III or IV (105 (79%) v 62 (46%) of younger patients; 95% confidence interval for difference 20% to 42%) and more elderly patients had been hospitalised for their symptoms at the time of angiography (35 (26%) v 12 (12%); 5% to 23%). Elderly patients had received more intensive antianginal drug treatment than younger patients: 46 (34%) were receiving treatment with three classes of antianginal drug compared with 18 (13%) in the younger group (12% to 32%).

ANGIOGRAPHIC FINDINGS

Table III shows the results of coronary angiography for the two groups. Nine elderly patients (7%) and 18 younger patients (13%) had normal coronary angiograms. The patients aged ≥ 70 years were more likely to have three vessel coronary artery disease (82 (61%) v 36 (27%); 23% to 45%) and the finding of a mainstem stenosis was much commoner in the elderly patients (28 (21%) v 5 (4%); 10% to 24%). The left ventricular function of elderly patients was more often impaired at left ventricular angiography (52 (39%) v 33 (25%); 3% to 25%).

TABLE I—Number of patients aged 70 or over undergoing coronary angiography

Year	No of patients
1978	2
1979	2
1980	2
1981	2
1982	1
1983	6
1984	15
1985	20
1986	27
1987	24
1988	33

TABLE II—Clinical characteristics of patients undergoing coronary angiography

Clinical feature	No (%) of patients aged ≥ 70 years (n=134)	No (%) of patients aged <70 years (n=134)	95% CI for difference between proportions	χ^2	df	p Value
Men:women	75 (56):59 (44)	103 (77):31 (23)	10% to 32%	13.1	1	<0.001
History of hypertension	30 (22)	32 (24)	-7% to 3%	0.1	1	0.77
Current cigarette smoking	27 (20)	59 (44)	14% to 35%	17.5	1	<0.001
Obesity (body mass index >25 kg/m ²)	52 (39)	88 (66)	15% to 38%	19.4	1	<0.001
Diabetes mellitus	9 (7)	4 (3)	0% to 9%	2.0	1	0.15
History of cerebrovascular disease	15 (11)	8 (6)	0% to 10%	2.3	1	0.13
History of claudication	20 (15)	5 (4)	4% to 18%	9.9	1	0.002
History of myocardial infarction	75 (56)	56 (42)	2% to 26%	5.4	1	0.02
History of coronary artery disease of more than five years	51 (38)	22 (16)	12% to 32%	15.8	1	0.001
New York Heart Association symptom class†:						
I (n=13)	1 (8)	12 (92)				
II (n=88)	28 (32)	60 (68)				
III (n=108)	61 (56)	47 (44)				
IV (n=59)	44 (74)	15 (26)		52.7	3	<0.001*
No of antianginal drugs†:						
0 (n=36)	16 (44)	20 (56)				
1 (n=63)	19 (30)	44 (70)				
2 (n=105)	53 (50)	52 (50)				
3 (n=64)	46 (72)	18 (28)		14.2	3	0.002*

CI=Confidence interval. * χ^2 test for trend. †Percentages are of all patients (≥ 70 or <70 years).

TABLE III—Angiographic findings in patients undergoing coronary angiography

Angiographic findings	No (%) of patients aged ≥ 70 years (n=134)	No (%) of patients aged <70 years (n=134)	95% CI for difference between proportions	χ^2	df	p Value
Coronary artery disease:						
None (n=27)	9 (33)	18 (67)				
Single vessel (n=55)	17 (31)	38 (69)				
Two vessel (n=68)	26 (38)	42 (62)				
Three vessel (n=118)	82 (69)	36 (31)		25.5	3	<0.001*
Left mainstem stenosis	28 (21)	5 (4)	10% to 24%	18.3	1	<0.001
Left ventricular function:						
Good	82 (61)	101 (75)				
Moderate or poor	52 (39)	33 (25)	3% to 25%	6.2	1	0.01

CI=Confidence interval. * χ^2 test for trend.

Initial and final allocations to treatment for older and younger patients after coronary angiography

Complications at coronary angiography were infrequent, even in the elderly group. One patient, a 70 year old man with a history of cerebrovascular disease, suffered a cerebrovascular accident during the procedure and died 36 hours later. No other death, myocardial infarction, or other non-transient complication occurred in either group.

CLINICAL OUTCOME AFTER ANGIOGRAPHY

After angiography patients were discussed at a meeting of physicians and surgeons. Some patients were allocated to surgical treatment or angioplasty. Some with very diffuse coronary disease or severe left ventricular impairment, or both, were judged to be technically unattractive for cardiac surgery and were allocated to continued or intensified medical treatment. Those considered to have a stable pattern of coronary disease were initially allocated to intensified medical treatment when feasible. If medical treatment failed to produce satisfactory control of symptoms some patients were then reallocated to treatment by angioplasty or surgery. The figure shows the initial and final treatment allocations for the elderly and younger groups.

Eight of the older and 11 of the younger patients underwent angioplasty. A total of 57 of the 134 elderly patients (43%) underwent operation compared with 55 (41%) of the younger group. The 112 operations were performed by seven different surgeons operating within one unit over the study period. In all, 44 (77%) of the elderly and 28 (51%) of the younger surgical patients had triple vessel disease. Main stem stenosis was present in 19 (34%) of the elderly and five (9%) of the younger patients, and impaired left ventricular function was present in 19 (34%) and 10 (18%) respectively. Urgent coronary bypass surgery (defined as within one week of angiography) was required by 15 of the 57 elderly surgical patients (23%) and by two of the 55 younger patients (4%).

The survival at 30 days and one year after elective

surgery was 95% (two deaths) and 93% (one further death) for the 42 elderly patients and 100% and 98% (one death) for the 53 younger patients. The survival after urgent cardiac surgery at both 30 days and one year was 60% (six deaths) for the 15 elderly patients and 100% for the two younger patients. Two of the six elderly patients who died after urgent operation had non-standard surgery. One had a punch ostiotomy for an isolated main stem ostial stenosis and one had additional repair of a post infarction ventricular septal defect. No younger patient had any alternative or additional procedure.

Table IV shows the preoperative and postoperative symptom classification and medical treatment of patients undergoing surgery. The elderly and younger surgical patients experienced equivalent improvement in symptoms and reduction in use of antianginal drugs.

TABLE IV—Symptoms and drug treatment before and one year after coronary artery surgery

	Patients aged ≥70 years (n=57)		Patients aged <70 years (n=55)	
	Before operation	1 Year after operation*	Before operation	1 Year after operation
New York Heart Association symptom class:				
I		29		38
II	8	11	18	10
III	27	7	31	6
IV	22		6	
Dead		9		1
No of antianginal drugs:				
0	3	28	2	29
1	6	13	17	20
2	22	4	25	4
3	26	2	11	1

*One patient in this group was lost to follow up.

Discussion

In 1990 about 11% of the United Kingdom population was aged over 70 years and 40% was aged 30-70.³ As the prevalence of angina pectoris in elderly people is approximately 10%,¹ compared with only 0.6-1.5% in the younger population⁴ it can be estimated that most people who suffer from angina in the United Kingdom are elderly. Nevertheless, substantially fewer elderly patients with angina undergo investigation by coronary angiography or treatment by coronary artery surgery. In this study patients aged over 70 represented only 5% of all patients having coronary angiography in 1988. Similarly, in the North American coronary artery surgery study only 3% of patients undergoing coronary arteriography were aged over 70 years,⁵ but the current rate of 15-20% for coronary bypass surgery in patients aged over 70 in some American surgical series⁶ suggests that the angiography rate may also have risen.

Selecting elderly patients for angiography and cardiac surgery is undoubtedly more complex than selecting younger patients. Older patients may be more prepared to reduce their physical activity to live within the limits imposed by their cardiac symptoms, and for some (but not all) the prospect of an improved prognosis is not important. In addition, some elderly patients have other medical problems which may compromise their capacity to survive or to recover from major surgery.

In our study, over an 11 year period those elderly patients who were selected for angiography differed substantially from younger patients. Elderly patients had more severe angina, were more likely to be hospitalised with unstable angina, were taking more antianginal drugs, and had been treated medically for a longer period; this suggests that quite different referral and selection policies for coronary angiography were applied to older and younger patients with angina, although we cannot at present determine whether this

occurred at the level of patient, general practitioner, general physician, or cardiologist. At angiography elderly patients had more severe and extensive coronary disease and had developed greater myocardial impairment, and as these factors, the severity of symptoms, and the need for urgent surgery have all been identified as predictors of surgical mortality⁶ these patients have an intrinsically higher operative risk, even before the effect of age is considered. We believe, therefore, that earlier referral and investigation of elderly patients who may be candidates for cardiac surgery—at a stage when their symptoms are limiting but not yet unstable—would yield a group for whom surgery could provide important symptomatic benefit, but at lower risk.

The implementation of such a policy would, in the context of our changing demography, place increased stress on already seriously overextended cardiac diagnostic facilities and staffing.⁷ Additionally, the provision of cardiac surgery within the NHS has tended to be restricted, and most cardiac surgery units have long waiting lists, often extending to over a year for non-urgent cases. In such circumstances of limited resources there is a danger that the medical needs of elderly patients may be looked on less favourably than those of younger patients, a prejudice termed agism.⁸ Although this method of discriminating between patients competing for a finite resource may be convenient, it is rarely rational, and we are not aware of any public consensus regarding prejudicial selection on the grounds of age as a means of distributing treatment

within the NHS. If finite resources require some patients to receive less than optimal treatment then this should be enacted by excluding those with less potential for benefit. A 70 year old patient with limiting angina and an average life expectancy of 10-14 years may often have such potential overlooked.

The successful outcome of coronary artery surgery in elderly patients with stable symptoms who are found at angiography to have coronary disease suitable for elective surgery supports the view that it is appropriate for an elderly patient with limiting angina to be referred for coronary angiography and, when necessary, added to the cardiac surgical waiting list. Only in this way can the necessary level of funding for cardiac surgery be identified.

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Dietary reduction of serum cholesterol concentration: time to think again

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Abstract

Objective—To evaluate the long term efficacy of diets in lowering serum cholesterol concentration.

Design—Descriptive overview of 16 published controlled trials of six months' duration or longer.

Setting—Trials had been conducted in hospital clinics (6), industry (3), mental hospitals or institutions (3), and in general populations (4).

Patients—Trials had been conducted in high risk subjects (5), in unselected healthy subjects (6), or for secondary prevention in patients with coronary heart disease (5). Women were included in only four trials.

Interventions—Diets equivalent to the step 1 diet were employed in eight trials, with individual intervention by dietitians (3) or occupational physicians (2) or with population advice (3). Intensive diets which were more rigorous than the step 2 diet were employed in eight trials.

Main outcome measures—Net change in serum total cholesterol concentration in subjects receiving treatment with diet compared with values in control subjects after six months to 10 years.

Results—In five trials with the step 1 diet as individual intervention the net reduction in serum cholesterol concentration ranged from 0% to 4.0% over six months to six years. In trials with population education reductions in cholesterol concentrations were 0.6-2.0% over five to 10 years. When population and individual dietary advice were combined changes in cholesterol concentration ranged from a fall of 2.1% to a rise of 1.0% over four to 10 years. Diets more intensive than the step 2 diet reduced serum cholesterol concentration by 13% over five years in

selected high risk men in the population; by 6.5-15.1% over two to five years in hospital outpatients; and by 12.8-15.5% over one to four and a half years in patients in institutions.

Conclusions—The response to a step 1 diet is too small to have any value in the clinical management of adults with serum cholesterol concentrations above 6.5 mmol/l. Current guidelines recommend screening of serum cholesterol concentration in healthy subjects, followed by treatment with a step 1 diet. The guidelines should be reviewed to provide a more realistic estimate of the effect of a step 1 diet and of the likely need for lipid lowering drugs.

Introduction

Every 1% reduction in serum cholesterol concentration reduces the risk of coronary events by about 1-2%.¹ Guidelines for managing patients with high cholesterol concentrations concur that diet is of prime importance in management,²⁻⁷ and advocate as initial treatment the step 1,⁶ or general lipid lowering diet (box).⁸ If this proves insufficient the more intensive step 2 diet is advised (box).⁶ These recommendations are based on epidemiological considerations⁹ and short term experiments.¹⁰ Estimates of cholesterol reduction by the step 1 diet range from 10% to 25%,^{6,8} but there are suggestions that it may be insufficiently effective.¹¹⁻¹³ In Britain about 40% of adults have serum cholesterol concentrations in the moderate to high risk category and are therefore considered to need clinical care,¹⁴⁻¹⁶ and a standing medical advisory committee has emphasised that cost effective management

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