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The Fate of Patients Undergoing Surveillance of Small Abdominal Aortic Aneurysms

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Objectives: *Increasing numbers of patients with small abdominal aortic aneurysms (AAA) are being diagnosed. The aim of this paper is to define the fate of those patients undergoing surveillance of small AAAs.*
Setting: *U.K. district general hospital.*
Methods: *A prospective study has been carried out of all patients undergoing surveillance. At the time of the first consultation the patient was assessed, a Detsky score calculated and the referral source noted. End points of the study were elective repair of the aneurysm, aneurysm rupture or death of the patient.*
Results: *Details of 267 patients were analysed. The referral source was general practitioner in 39%, patients with peripheral vascular disease in 32% and department of urology in 21%. None were referred from population screening. The cumulative 5-year risks of rupture, elective repair or non-AAA related deaths were 15%, 26% and 46% for all patients, 4%, 13% and 38% for patients initially presenting with AAA less than 4 cm diameter and 21%, 42% and 54% for patients presenting with an AAA 4–5.5 cm diameter. All but one of 11 patients whose aneurysm ruptured were unfit or had declined elective repair. There were 56 non-AAA related deaths, the majority due to cardiovascular causes. Those patients with low Detsky scores had a 5-year survival of 62%, those with high scores 44%. The age/sex matched survival of a normal population at 5 years is 80%.*
Conclusion: *Overall the non-AAA related mortality was greater than the risks of rupture or elective repair. It is important to bear in mind the poor prognosis of this group of patients compared with a normal population when considering elective repair of small AAAs.*

Introduction

Approximately one-third of patients presenting electively with abdominal aortic aneurysms (AAA) will have aneurysms not sufficiently large to warrant immediate repair.[1] These patients will require ultrasound scanning surveillance so that the growth rate of the aneurysm can be measured. There has been much research to determine the growth rate of different sizes of aneurysm and factors which may or may not affect it. These include size of aorta in relation either to the patients' build, age and sex[2] or the diameter of the aorta compared with the size of the third lumbar vertebral body.[3] Other factors studied include morphology of the aneurysm,[4] the volume of thrombus within it,[5] whether the patient smokes[6] and whether the patient takes beta blockers.[7] Similarly, the timing of elective operation based upon symptoms developing, rate of AAA expansion or absolute diameter have been widely debated.[8]

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Less emphasis has been placed upon the fate of the patient undergoing surveillance. It is well recognised that patients with AAA often have symptomatic or asymptomatic coronary artery disease.[9] The aneurysm may also have been discovered whilst the patient was being investigated for other conditions. The aim of this paper was to define what happens to the patient undergoing AAA surveillance.

Methods

Since 1991 all patients presenting with small AAAs were entered into an ultrasound surveillance programme. They have been studied prospectively. Patients with aneurysms less than 4 cm in diameter were scanned at yearly intervals and those with aneurysms between 4 and 5.5 cm at 6-monthly intervals.[10] Surgical repair was considered if the aneurysm became symptomatic, was larger than 5.5 cm or expanded at more than 1 cm per year. If the patient was deemed unfit at that time the patient simply continued to have monitoring of the aneurysm whilst risk factors were,

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whenever possible, corrected. Ultrasound was performed using a Diasonics DRF 100 real-time scanner (Diasonics Sonotron Ltd, Bedford, U.K.) with a 3.5 MHz probe.

At the time of the first consultation, the patient was assessed medically, a Detsky score calculated and the source of referral noted. The Detsky index is a modification of Goldman's index to define patients at risk of cardiac morbidity and mortality. Essentially, symptoms such as myocardial infarction, angina, left ventricular failure, arrhythmias on ECG and associated medical conditions are given a score. The higher the score, the greater the chance of cardiac problems developing.[11,12,13]

The end points of the study were elective repair of the aneurysm, aneurysm rupture or death of the patient. The cause of death was established by post-mortem examination, death certificate examination or by consultation with the patient's general practitioner.

Results

Since 1991 267 patients have been enrolled into the study. There were 206 men and 61 women. The median age of the men was 71 years (range 38–87 years) and that of the women 74 years (57–90 years). Overall 109 patients were aged more than 74 years and 34 more than 80. The general practitioner referred 104 (38.9%) patients directly. Patients with peripheral vascular disease being screened for AAA accounted for 84 (31.5%). Fifty-seven (21.3%) were referred from the urologists having had abdominal ultrasound as part of their investigation for urological symptoms. The remainder were mainly referred from other departments within the hospital. No patient was referred as a result of population screening. One-hundred and forty-one patients had aneurysms of diameter less than 4 cm on initial presentation. The median age was 72 years (38–90 years). One-hundred and twenty patients presented with aneurysms 4.0–5.5 cm (median age 74 years (54–86)). Six patients had aneurysms greater than 5.5 cm in diameter but were deemed unfit for repair at the time of their initial visit (median age 78 years (61–87 years)).

Figs 1–3 show actuarial analysis of risk of rupture, elective repair or non-AAA related deaths for the group as a whole and for patients having aneurysms of sizes less than 4 cm and 4.0–5.5 cm on initial presentation. The predicted 1, 3 and 5-year survival for the normal population age and sex matched to those patients is 96%, 88% and 80%, respectively.[14] It can be seen that for the group as a whole (Fig. 1) the non-AAA related death rate of 46% is greater than the combined rate of rupture (15%) or "potential" rupture, i.e. elective repair (26%).

During the study period 11 AAAs ruptured. One patient survived an emergency repair whilst the others died. In all but one case the aneurysm was known to have reached a size where the risk of rupture was high but the patient was either unfit (seven patients) or declined to have an elective repair (three patients). The unfit patients all suffered severe cardiorespiratory disease. The remaining patient was a 78-year-old woman with an aneurysm measured at 4.8 cm 3 months before rupture. She was unfit, having had a myocardial infarction, and was suffering from angina (Detsky score 20). In 38 cases elective AAA repair was carried out.

Death unrelated to AAA occurred in 56 patients. Cause of death is shown in Table 1. It can be seen that the majority of deaths were due to cardiovascular disease, mainly myocardial infarction. The non-AAA related survival of patients depending on whether they are low risk (Detsky score 0–5) or high risk (Detsky score 10 or more) is shown in Fig. 4, the 5-year survival being 62% and 44%, respectively. Of the 10 patients dying of malignant disease, eight were being investigated for that malignancy when the AAA was discovered. Four patients had carcinoma of the prostate. In only eight patients was a post-mortem carried out. In 27 other cases death took place in hospital with a firm clinical diagnosis. The mode of death excluded ruptured AAA in 18 others. Nevertheless, there are three patients in whom the cause of death has not been explained.

No differences were apparent in survival, rupture rate or elective repair rate when comparing men with women.

Discussion

Patients with AAAs, with or without associated occlusive disease have an increased risk of coronary disease.[9] Following elective repair the 30-day operative mortality, which is approximately 5%, is largely due to cardiac complications.[15] Survival following repair, in those patients at low cardiac risk as calculated by Detsky scoring, is similar to that of the normal population.[12] On the other hand, patients with high Detsky scores have a poorer survival. Furthermore, patients in the high risk group have a significantly greater number of cardiac events than those in the lower risk groups. The present study shows a high mortality during surveillance which in almost half of the cases is due to myocardial infarction.

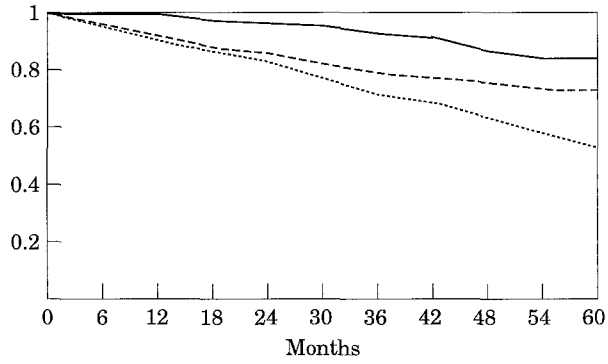

Fig. 1. Actuarial survival (.....), elective repair (-----) and rupture (—) for all patients.

Interval	No. alive	Rupture	Lost to FU	Cumulative chance	Non AAA related deaths	Cumulative chance	Elective operation	Cumulative chance
0	267			1.000		1.000		1.000
6	249	0	7	1.000	9	0.963	9	0.963
12	218	0	10	1.000	12	0.909	9	0.923
18	160	3	4	0.981	7	0.869	7	0.882
24	128	1	0	0.973	5	0.835	3	0.861
30	103	1	2	0.964	7	0.778	4	0.827
36	78	2	2	0.939	6	0.717	3	0.795
42	56	1	3	0.922	2	0.691	1	0.781
48	41	2	1	0.876	3	0.640	1	0.761
54	34	1	2	0.849	3	0.581	1	0.738
60	26	0	1	0.849	2	0.536	0	0.738

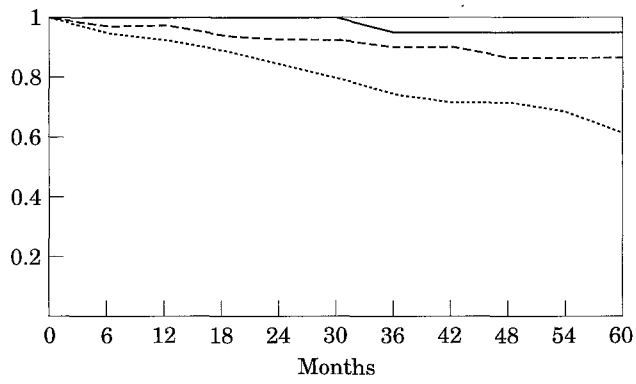

Fig. 2. Actuarial survival (.....), elective repair (-----) and rupture (—) for patients having AAA less than 4 cm diameter on presentation.

Interval	No. alive	Rupture	Lost to FU	Cumulative chance	Non AAA related deaths	Cumulative chance	Elective operation	Cumulative chance
0	141	0		1.000		1.000		1.000
6	131	0	4	1.000	6	0.953	3	0.977
12	111	0	4	1.000	3	0.927	0	0.977
18	88	0	2	1.000	3	0.895	3	0.943
24	74	0	0	1.000	4	0.847	1	0.930
30	57	0	1	1.000	3	0.802	0	0.930
36	46	2	2	0.956	3	0.748	1	0.910
42	30	0	2	0.956	1	0.723	0	0.910
48	25	0	1	0.956	0	0.723	1	0.873
54	22	0	1	0.956	1	0.689	0	0.783
60	19	0	0	0.956	2	0.617	0	0.873

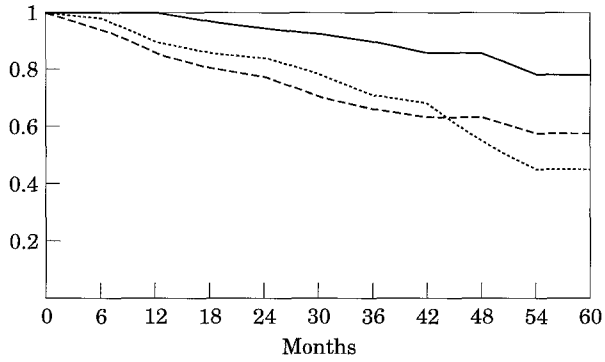

Fig. 3 Actuarial survival (.....), elective repair (- - - - -) and rupture (—) for patients having AAA 4–5 cm diameter on presentation.

Interval	No. alive	Rupture	Lost to FU	Cumulative chance	Non AAA related deaths	Cumulative chance	Elective operation	Cumulative chance
0	120			1.000		1.000		1.000
6	113	0	3	1.000	2	0.982	6	0.946
12	102	0	5	1.000	8	0.903	9	0.861
18	69	2	2	0.971	3	0.863	4	0.810
24	53	1	0	0.952	1	0.847	2	0.779
30	45	1	1	0.931	3	0.790	4	0.709
36	32	1	0	0.902	3	0.716	2	0.665
42	25	1	1	0.865	1	0.687	1	0.638
48	15	0	0	0.865	3	0.549	0	0.638
54	12	1	1	0.790	2	0.454	1	0.582
60	7	0	1	0.790	0	0.454	0	0.582

Other studies have emphasised the high mortality in patients undergoing surveillance. This ranges from 13% to 43% and is clearly dependent upon the length of follow-up (16–18). The actuarial survival in our series at 5 years was 54%. The cause of death in between a half and two-thirds of cases is "cardiovascular", the majority being cardiac. On the other hand these patients have been reported as having a low risk of rupture. In a series of 110 patients with aneurysms of less than 5 cm diameter, Glimaker *et al.* described a rupture rate of 2.5% at 1 year with no increase at 7 years. This compares with only a 55% survival of this group as a whole at 5 years.[16] These results are similar to our own. Nevitt *et al.* reported no rupture during a 5-year follow-up of 130 patients with an aneurysm less than 5 cm in diameter.

The rate of elective repair in these cases varies between 13 and 40%.[16–18] This will depend upon the length of follow-up and precise timing of any intervention. Most people agree that tender aneurysms and those enlarging rapidly should be electively repaired. Debate continues as to the absolute size at which repair should take place. The cut-off points ranging from 4.5–6 cm.[18,20]

Table 1. Cause of death.

Myocardial infarction	26
Cerebrovascular accident	7
Left ventricular failure	2
Pulmonary embolus	2
Ischaemic gut	1
Bronchopneumonia	5
Malignancy	10
Unknown	3

There are data in the literature which suggest that small AAAs can be safely repaired. The question is whether they should be. In a series from the Mayo clinic, 39 AAAs of less than 5 cm in diameter were electively repaired.[21] The operative mortality was 2.6% which compared with 5.5% for larger aneurysms. However, the 5-year survival after repair of a small AAA was only approximately 62%. This is very similar to the unoperated 5-year survival in our series. Endovascular repair has also been carried out on patients with small AAAs.[22] In a non-randomised comparison 43 patients having endovascular repair were compared with 67 patients treated conservatively. There were two perioperative deaths in the repair group and local vascular complications occurred in 11. Systemic complications occurred in 10 patients. On the other hand one of the 67 patients treated expectantly had an aneurysm which ruptured. We are not told the size of this aneurysm at the time of the last scan and whether or not the patient was fit for repair. In 21 of the 67 cases the aneurysm grew to greater than 5 cm in diameter, 11 operations were carried out.

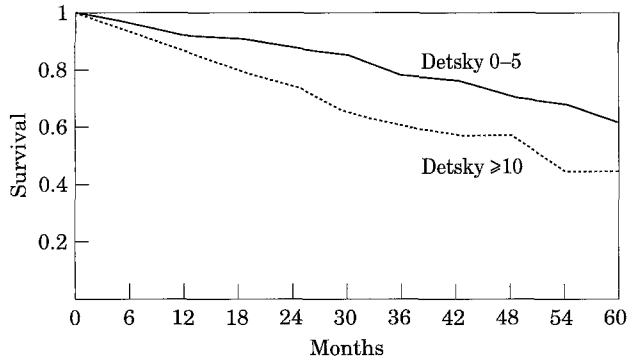

Fig. 4. Actuarial survival for Detsky low risk (—) and high risk (- - -) patients.

Interval	No. Alive	Deaths	Lost to FU	Cumulative chance of survival
Detsky 10 plus				
0	95			1.000
6	91	5	1	0.945
12	80	6	1	0.873
18	61	5	1	0.801
24	49	3	0	0.752
30	38	5	1	0.652
36	27	2	1	0.603
42	20	1	2	0.571
48	13	0	1	0.571
54	9	2	1	0.437
60	5	0	1	0.437
Detsky 0-5				
0	170			1.000
6	157	4	6	0.974
12	136	6	8	0.930
18	98	2	3	0.910
24	78	2	0	0.887
30	64	2	1	0.859
36	50	4	1	0.790
42	35	1	1	0.767
48	27	2	0	0.710
54	25	1	1	0.681
60	21	2	0	0.616

* Detsky score not calculated to two patients.

Approximately one-third of patients in our series presented as a result of routine screening of patients with peripheral vascular disease.[23] These patients are known to have a poorer prognosis than the rest of the population.[24] The referral source is clearly relevant to the patients' outcome. Several of our patients had the AAA diagnosed during investigation for malignant disease elsewhere. Survival of patients diagnosed as having AAA during population screening may well be greater than that described here. The screened patients are likely to be fitter and younger. The upper age limit for three large screening projects in the U.K. has been 74[25,26] and 80 years.[27] These exclusion criteria would have applied to 41% and 13%, respectively, of patients described here.

Randomised trials are presently being evaluated comparing operative with non-operative treatment for patients with small AAAs.[28] Bearing in mind the poor survival of these patients, it is probably best not to repair small asymptomatic aneurysms until and unless the trials show otherwise.

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