Should we screen for abdominal aortic aneurysm?

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YES Around 5% of men aged between 65 and 74 have abdominal aortic aneurysms (maximum infrarenal aortic diameter of at least 3 cm).¹ The prevalence is some six times lower in women. Aneurysms expand inexorably² without causing symptoms until they rupture or the individual dies of another cause. When rupture occurs, barely half of the patients reach hospital alive.³ Of those who do, 40-60% do not survive to discharge, giving an overall mortality for ruptured aortic aneurysm in the region of 80%. Nearly 5000 people die of this condition each year in England and Wales.⁴

Some aneurysms are diagnosed before rupture occurs, but at present this is largely fortuitous. Conventional open repair of unruptured aneurysms below the renal arteries (95% of the total) carries a mean mortality of 9.5%,⁵ although recent UK series have reported mortalities of 5.5%, 6%, and 4.2%.^{2,5,6} Endovascular repair of aneurysms in the 60-70% of patients for whom this procedure is anatomically suitable carries a mortality of 1.6%.⁶ The advantage of having an aneurysm repaired before it ruptures is thus enormous.

Abdominal aortic aneurysms can be reliably detected by ultrasonography. The condition therefore fulfils admirably the criteria laid down by the UK National Screening Committee⁷: the condition is an important health problem, it can be readily detected by a simple test, and it can be treated much more effectively at the asymptomatic stage than once rupture has occurred.

Nevertheless, confounding factors may make screening programmes ineffective. These include poor uptake of invitations to be screened by elderly people and a higher than expected mortality from surgical treatment of screen detected aneurysms. A screening programme would certainly result in some people having surgery for aneurysms that would not have ruptured during their lifetime. There might be an adverse effect of the invitation to be screened, or of discovery of an aneurysm

too small to require immediate treatment, on quality of life.

Evidence for screening

The UK screening committee based its decision to back screening programmes on the results of four randomised clinical trials: two in the UK,^{5,8} one in Western Australia,⁹ and one in Denmark.¹⁰ All but one (Chichester, UK) screened men only. The study populations ranged in age from 65 years to 73 (Denmark), 74 (UK multicentre aneurysm screening study (MASS)), 79 (Australia), or 80 (Chichester). Participants were randomised either to be invited for screening by ultrasonography or to no intervention. The principal end points were all cause mortality and aneurysm related mortality. Median follow-up in these trials now ranges from 43 months to 15 years.

Uptake of invitations to be screened ranged from 63% to 80% (80% for UK patients aged 65 to 74 years). Only one trial (Western Australia) showed a reduction in all cause mortality among patients invited for screening, something which none of them was powered to detect, but all four showed reductions in aneurysm related mortality ranging from 11% after 15 years median follow-up to 67% after 52 months (and the reduction was significant in the Danish and MASS trials).

A Cochrane review of aggregated data from these trials (which does not include recently published long term follow-up data) showed a small (5%) and non-significant reduction in all cause mortality among patients invited for screening but a highly significant reduction in aneurysm related mortality (odds ratio 0.60; 95% confidence interval 0.47 to 0.78).¹¹ The Chichester study reported a significant reduction in aneurysm rupture rates in the screening group (0.45; 0.21 to 0.99).

The MASS study reported a cost per life year gained of £28 000 (€37 000; \$56 000) after a median follow-up of 4.1 years. The authors estimated that this would fall to £8000 after 10 years' follow-up. They recently published results derived from a median follow-up of seven years, which showed that the cost per life year gained had fallen to £12 342.

A national screening programme has the

potential to prevent up to 2000 deaths a year in England and Wales from aneurysm related causes at a cost that is comparable to or below that achieved by other screening programmes. By screening all men just once, when they reach the age of 65, the cost will be reduced further with little loss of effectiveness. An economic analysis produced by the Centre for Reviews and Dissemination of the University of York in 2005¹² concluded that the likelihood of such a programme being cost effective was greater than 95%.

The US Preventive Services Task Force has reached similar conclusions about the value of screening to those of the UK committee. The Department of Health's decision to establish pilot screening services in England and its intention to screen all 65 year old men within 10 years indicate that the argument for screening for abdominal aortic aneurysms has been won. Attention now needs to be focused on making the screening programme as efficient and effective as possible.

Competing interests: None declared.

In January, the government announced five pilot screening programmes for aortic aneurysm in men aged 65 in England. **Stephen Brearley** describes the rationale for this proposal while **James Johnson** argues that it is not without pitfalls

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NO The case for screening for abdominal aortic aneurysms looks open and shut. Mortality for patients with a ruptured aneurysm is around 90% if you include those who do not survive until the ambulance arrives.^{1,2} But if the aneurysm is discovered before it ruptures and is repaired electively, the mortality in the hand of an experienced vascular surgeon is around 7.4% in England.³ Unfortunately abdominal aortic aneurysms rarely give rise to symptoms and so are not diagnosed before they rupture. Screening would ensure that most aneurysms in the appropriate age group will be picked up and could be repaired electively.

The UK government seems convinced, and pilot screening programmes for men aged 65 were launched this year. But I believe this move is overhasty. The average mortality

for surgical repair, which comes from an epidemiological survey of 112 545 diagnoses or repairs,³ hides wide variations between hospitals. In addition, the headline case fatality rate is higher in England than that reported in most other countries.⁴ Specialist centres providing 24 hour access to vascular surgeons and radiologists trained in emergency endovascular repair would reduce mortality.

Questionable ethics

My main objection, however, is that I'm uneasy about taking people off the street who think they are perfectly well and subjecting them to a procedure from which 1 in 14 will die. It's a difficult decision to justify to a grieving family who may well have taken in the positive messages about screening and early treatment without really absorbing the small but real level of risk associated with surgery.

Aneurysms are rather like balloons—the bigger they get the more likely they are to burst. We know that aneurysms with a diameter of less than 5.5 cm are so unlikely to burst that the mortality from operating on them is greater than the likelihood of rupture.⁵ People who have been screened and found to have an aorta that is dilated less than 5.5 cm will be condemned to six monthly or annual ultrasound examinations to estimate the size of the aneurysm. Some grow, some don't; and the ones that grow quickly are the most dangerous. The only way to find out is serial measurements. This in itself is straightforward enough, but all vascular surgeons have a cohort of patients who find it intolerable to have what they often describe as a "time bomb" inside them which might go off at any time and without notice.

Feasibility of repair

Even when the aneurysm grows to more than 5.5 cm, what happens next is not always straightforward. Although in an otherwise healthy patient the risk of rupture is greater than that of surgery, aneurysm patients are seldom "otherwise healthy." An aneurysm is a disease of an artery, and arterial disease rarely exists in isolation. Most patients will have hypertension or a history of myocardial infarction or stroke. Some are diabetic. More

often they are heavy smokers and have pulmonary disease. Often comorbidity is discovered during the work-up for aortic surgery, and sometimes the coronary artery disease or lung cancer has to be dealt with first.

So aneurysm screening will turn up much more than aortic aneurysms, and the cost of dealing with the comorbidity needs to be included in the cost-benefit analysis. Many patients will not be fit enough to have a repair and will be left knowing that the time bomb in their abdomen doesn't just have a remote possibility of exploding but is quite likely to do so soon. Admittedly some, probably

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more than half, of these high risk patients can be treated with an aortic stent⁶—a lesser surgical procedure which simply

requires access to the femoral arteries by incisions in both groins. The cost effectiveness of this form of treatment is, however, uncertain.⁷ There is also long term uncertainty about the security of the devices and persistent leaks into the aneurysmal sac (endoleaks).⁸ So patients with endovascular repairs have a new time bomb in the abdomen—a prosthesis that may come loose or leak (thus revascularising the aneurysm).

In a minority of patients, the configuration of the aneurysm or the condition of the patient makes even endovascular repair impossible. In any case NHS commissioners take very different views about the extent to which they are prepared to purchase endovascular repair saying (incorrectly⁹) that it is still experimental.

In short, many patients will be left with the knowledge that they have a life threatening condition that is liable to cause sudden death and that nothing can be done about it. It doesn't affect the arithmetic of lives saved but it is a serious social consequence that needs to be thought through. At the very least, as with HIV, any member of the public taking the test will need intensive counselling about the possible consequences that screening might have for their future lives and psychological wellbeing.

Competing interests: None declared.

All references are in the version on bmj.com

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