A Seasonal Variation in the Incidence of Ruptured Abdominal Aortic Aneurysms

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Objective: To discover whether there is a seasonal variation in the incidence of rupture of abdominal aortic aneurysms.

Design: Deaths per month due to rupture of abdominal aortic aneurysm were analysed retrospectively using a cosinor regression model.

Setting: England and Wales.

Subjects: 19,599 patients who died from rupture of abdominal aortic aneurysm between January 1991 and December 1995 according to death certification data.

Interventions: None.

Results: A seasonal variation in the incidence of rupture of abdominal aortic aneurysm occurs, with a peak in winter (p = 0.003). The ratio of rupture of abdominal aortic aneurysm in males and females decreased from more than 12 to 1 below age 60 years to less than 5 to 1 over age 80 years.

Conclusions: There is a seasonal variation in the incidence of recorded deaths from abdominal aortic aneurysm in England and Wales, with a peak of deaths in the cold winter months. The underlying cause is unknown, but hypertension and tobacco smoking are predisposing factors to aortic aneurysm rupture. Exposure to tobacco smoke is known to be greater indoors in cold weather and there is a winter peak of blood pressure in hypertensive patients.

Introduction

Several authors have commented on a possible seasonal variation in the incidence of rupture of abdominal aortic aneurysm, but the patterns have been inconsistent.¹⁻⁹ Some have shown an increased incidence of rupture in winter, others in spring and autumn. In four studies no seasonal variation was observed. No analysis to date has used a sufficiently large data base to be able to establish convincingly whether or not any seasonal difference in the incidence of ruptured abdominal aortic aneurysm occurs. To answer this question we have analysed mortality statistics for England and Wales over a 5-year period.

Methods

Data including all deaths due to rupture of abdominal aortic aneurysm (international classification of diseases 441.3) in England and Wales from January 1991 to December 1995 were obtained from the Office of Population Censuses and Surveys. The data were subdivided to show the number of deaths per month, for each 5-year age-group, for both sexes.

The male to female ratio of deaths due to rupture of abdominal aortic aneurysm was calculated using the average number of deaths for each 5-year age-group adjusted for differences in population of each group using the 1991-1995 census figures for the corresponding age groups.

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Results

There were 19,599 deaths due to ruptured abdominal aortic aneurysm over the 5-year period. The mean monthly death rate was 326.65 (standard error 18.36, range 245-417). Sine-cosine regressions were fitted to the summed monthly figures for deaths due to ruptured abdominal aortic aneurysm over the 5-year period for each sex separately, and for the combined data (Fig. 1). The S-Plus statistical analysis package was used.¹⁰ All three regressions were significant at the p<0.01 level. In all three groups a peak in winter months was evident. The r and p values for the regression curves were: r = 0.861, p = 0.003 for all deaths,
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Fig. 1. Graph showing the sum of deaths of males and females due to rupture of abdominal aortic aneurysm per month between January 1991 and December 1995 with cosinor regression curve ($r=0.861$, $p=0.003$).

Fig. 2. Graph showing the ratio of male to female deaths due to ruptured abdominal aortic aneurysm for 5 year age groups between January 1991 and December 1995 with spine curve.

$r=0.847$, $p=0.005$ for male deaths and $r=0.835$, $p=0.007$ for female deaths.

The male to female ratio of deaths due to ruptured abdominal aortic aneurysm is shown in Fig. 2.

Discussion

Previous studies investigating whether there is a seasonal variation in the incidence of rupture of abdominal aortic aneurysm have used small databases and produced inconsistent results. To discover the true incidence of rupture of abdominal aortic aneurysm it is necessary to identify all aneurysm ruptures occurring in the community and in hospital in a defined geographic area. The overall mortality from rupture of abdominal aortic aneurysm has been estimated as 85 per cent, although some authors have reported rates as high as 94 per cent. Patients who survived rupture will have been excluded from our study but their proportion of the total number of ruptured abdominal aortic aneurysms is unlikely to be affected by seasonal factors. The number of deaths due to rupture of abdominal aortic aneurysm obtained from death certification may be inaccurate because of the low autopsy rate in the United Kingdom, but certification errors are likely to be consistent throughout the year.

The pathogenesis of abdominal aortic aneurysm involves a complex interaction of factors which weaken the aortic wall and increase the load upon it. Size of the aneurysm, cigarette smoking, the presence of systemic hypertension, and coexisting chronic obstructive pulmonary disease, are all established or probable risk factors for rupture. A seasonal variation in blood pressure with a peak incidence in winter has been demonstrated in both male and female hypertensive patients and there is some evidence to suggest that this variation is also present in normotensive subjects.

We are aware of no data on seasonal variation in smoking habits, but the effects of passive smoking on ischaemic heart disease and asthma are greater indoors in poorly ventilated rooms.

Seasonal variations in the incidence of other cardiovascular diseases have been reported. Increases in platelet count, plasma viscosity and thrombus formation in cold weather have been demonstrated and may be the cause of the increased incidence of coronary and cerebral thrombus formation in winter. Increased blood pressure and plasma viscosity may produce damage to the aneurysm wall, and this has been suggested as a possible cause for the seasonal variation in the incidence of ruptured intracranial aneurysms.

The decreasing ratio of male to female incidence of death from rupture of abdominal aortic aneurysm with advancing age may be a statistical rather than a biological phenomenon. It largely mirrors the narrowing differences in risk of death between males and females from all cardiovascular disease with advancing years.

References

Seasonal Variation in Ruptured AAA


Accepted 15 January 1998