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Ruptured abdominal aortic aneurysm in the Huntingdon district: a 10-year experience

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A study was undertaken to establish the true incidence of ruptured abdominal aortic aneurysms (RAAA) in the Huntingdon district.

RAAAs in the Huntingdon district between 1986 and 1995 were studied retrospectively. Data were collected from hospital records and hospital and community autopsies.

There was a total of 139 cases of RAAA; 119 were males and 20 females, giving a M:F ratio of 6:1. The incidence of RAAAs was 17.8/100 000 person years (py) in males and 3.0/100 000 py in females. Mean age at rupture was 75.5 years in men (95% confidence intervals (CI) 74–78 years) and 80.2 in women (95% CI 78.8–83 years). There was an age-specific increase in incidence after the age of 65 years in men and after 80 years in women, although 12.6% of all RAAAs occurred in men under 65 years.

In all, 110 patients were confirmed to have died of RAAA during the 10-year period. This represents 79% of all ruptures discovered. Almost three-quarters of patients did not reach the operating theatre. Of the 61 patients operated on, 29 survived (48%).

The size of the aneurysm at rupture was recorded in 68 cases (49%). The mean size was 8.14 cm (SD 2.0 cm). In five cases (7.4%), rupture occurred in AAAs smaller than 6 cm.

The overall mortality from RAAA in Huntingdon health district is approximately 80% and three-quarters of all deaths occurred without an operation.

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The exact incidence of RAAA is unknown because a large proportion of patients die before reaching hospital. The incidence of RAAA nationally appears to be rising. This may be because of an increasingly elderly population at greater risk, together with better diagnosis, in addition to a true rise in incidence *(1–4)*.

RAAA is responsible for more than 1.3% of deaths in men over the age of 65 years *(1)*, accounting for over 10 000 deaths a year in England and Wales *(1)*. The majority of deaths occur in the community. Of those who reach hospital, less than half survive an operation *(1,2)* and these survivors represent the 'tip of the iceberg' of ruptures.

Screening for AAA has been shown to reduce the incidence of RAAA by as much as 50%, with a corresponding decrease in mortality *(5)*. However, it is important to know the background incidence of RAAA in order to estimate the number of lives which could potentially be saved by screening. The aim of this study was to estimate the background incidence of RAAA in Huntingdon District Health Authority (DHA) between 1986 and 1995 as accurately as possible. Screening of the male population of the district for AAA began in November 1991. By the end of 1995, 41% of the male population over 50 years of age had undergone ultrasonographic screening for AAA (Fig. 1).

Methods

Huntingdon district has a population of approximately 37 000 people, male and female, above the age of 50 years. Virtually all surgical emergencies occurring in the district are admitted to a single hospital, Hinchingbrooke, in Huntingdon.

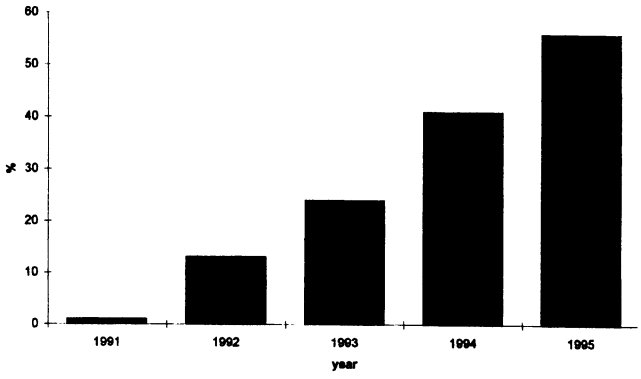

Figure 1. Percentage of males over 50 years of age invited for screening by year. The aneurysm screening programme started in Huntingdon in 1991.

Strenuous efforts were made to trace all cases of RAAA between 1986 and 1995 in the Huntingdon District Health Authority. These were traced from the following sources:

Post-mortem registers

Registers were checked to trace those patients who had died from an RAAA in hospital or in the community. All patients who die suddenly and unexpectedly in the Huntingdon district and who are referred to a coroner, undergo a post-mortem. Nearly all post-mortems were performed at Hinchingbrooke hospital, but a few earlier post-mortems, in 1986 and 1987, were carried out at a nearby hospital out of the district. Registers from both hospitals were consulted.

Operating theatre registers

Theatre registers were consulted to identify those patients who underwent an emergency operation for an AAA. The notes for all the patients identified were then consulted to identify those who were confirmed at operation to have a ruptured AAA. Any found not to have a rupture were excluded, even if rupture was the preoperative diagnosis.

To ensure that as few cases as possible were missed, accident and emergency registers, ITU admissions registers and the hospital computer system were also searched for the entire study period to find any patients who presented to the hospital with RAAA but were not operated upon or who were transferred elsewhere.

Because of the well-publicised aneurysm screening programme, hospital staff and general practitioners in the district were 'aneurysm aware' and perhaps more likely to consider RAAA as a cause of sudden death. The only patients with rupture likely to have been missed are those who died suddenly in the community or in hospital and who did not have a post-mortem and to whom a wrong cause of death had been attributed. Numbers are necessarily unknown but are likely to be small.

To obtain an approximation guide to the proportion of deaths in the community referred to the coroner, ten GP practices in Huntingdon were selected randomly and contacted by telephone. All GPs contacted said most deaths among their patients occur in hospital. In hospital, a patient dying from a RAAA is very likely to undergo an autopsy. In the community, GPs reported that all sudden unexpected deaths are automatically referred to the coroner, especially if a doctor had not seen the patient in the 14 days before death. All deaths which are referred to the coroner subsequently have an autopsy. Only where the GP was confident of the cause of death was a death certificate issued without an autopsy, ie in patients known to have a terminal illness or severe chronic diseases such as ischaemic heart disease or chronic airway disease. This information tended to confirm that the number of missed deaths from RAAA was small.

Analysis

Population data for Huntingdon were obtained from the Office of National Statistics. Confidence intervals (CI) were calculated at the 95% level.

Results

In the 10-year period studied (1986 to 1995) there was a total of 139 cases of RAAA; 119 were males and 20 females, giving a ratio of 6:1 (CI 3.7 to 9.6). A further four cases who had an emergency operation for suspected RAAA were found at operation not to have ruptured and were excluded. The mean age at rupture was 75.5 years in men (CI 74–77 years) and 80.2 years in women (CI 78.8–83.6 years). The mean age at rupture rose from 73 years in 1986 to 79 years in 1994.

Incidence

The overall incidence of RAAA in the 10-year period was 17.8 per 100 000 patient years (py) in men (CI 16.2–19.5 years) and 3.0 per 100 000 py in women (CI 2.2–3.6 years). There was an age-related increase in incidence after the age of 65 years in men and after 80 years in women (Fig. 2). However, it should be noted that 15 cases of ruptured AAA occurred in men under 65 years of age (12.6%).

During the 10-year period, there was a year-to-year variation in the incidence of RAAA in both men and women, but over the whole 10-year period there was no consistent rise in incidence (Fig. 3). Indeed, comparing the overall male incidence of RAAA in the earlier 5 year period (1986–1990) with the later 5 year period (1991–1995), there was a fall from 21.1 per 100 000 py to 14.6 per 100 000 py. In contrast, the female incidence rose from 1.8 per 100 000 py in 1986–1990 to 4.3 per 100 000 py in 1991–1995 (Table I).

The Huntingdon aneurysm screening programme for men over 50 years of age began in November 1991 and a progressively greater proportion of men in the district was screened with each passing year (Fig. 1). By the end of 1995, 56% of the male population over 50 years of age had been invited for screening, of whom 74% attended and were screened.

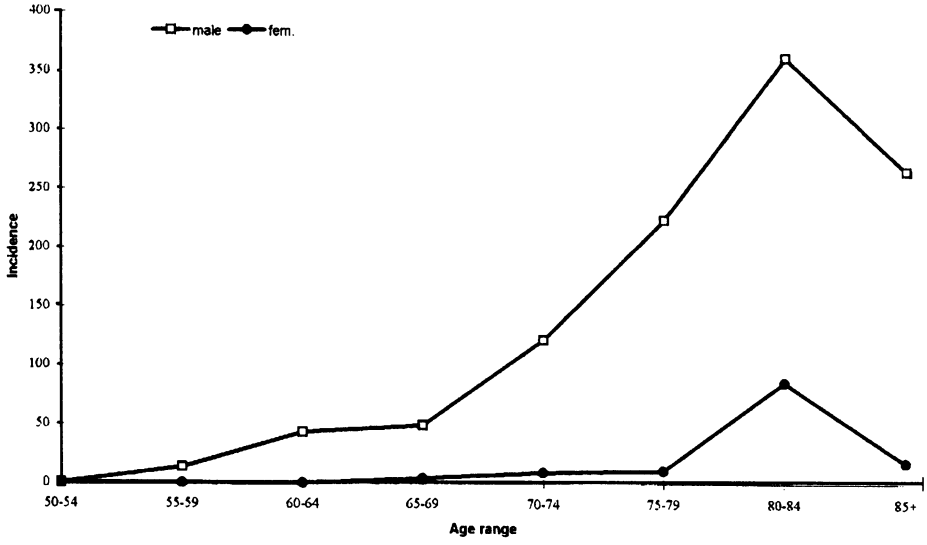

Figure 2. Incidence of RAAA related to age.

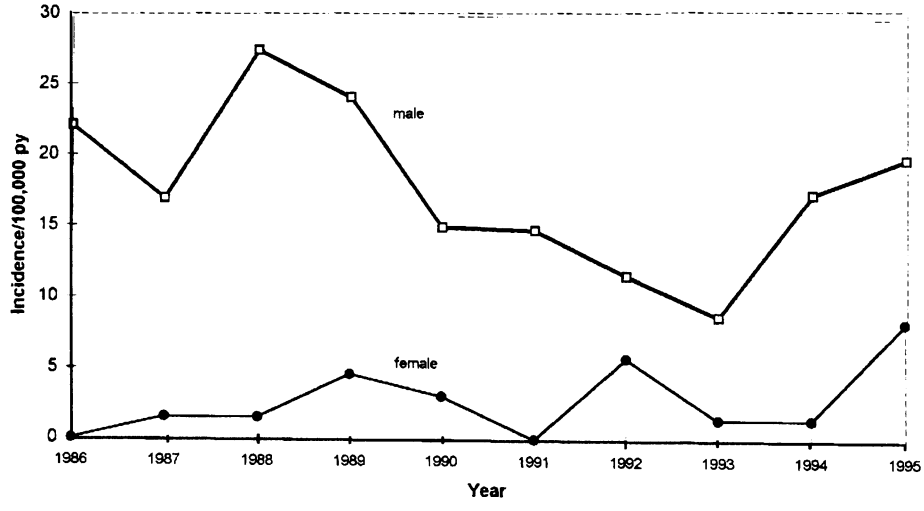

Figure 3. Incidence of RAAA by year of study.

Table I. Incidence of RAAA per 100 000 patient years in males and females with 95% confidence intervals

	1986–1990	*1991–1995*
Males		
n	69	50
Incidence (CI)	21.1 (16.7–26.7)	14.6 (11–19.2)
Females		
n	7	12
Incidence (CI)	2.2 (1–4.5)	3.4 (2–6.1)

Mortality (Fig. 4)

Of the 139 patients with RAAA, 110 (79%) died during the 10-year period (95 males and 15 females). Of these, 54 (50%) died at home or were declared dead on arrival in casualty. Of those reaching hospital alive, two patients were transferred to other hospitals because of a temporary

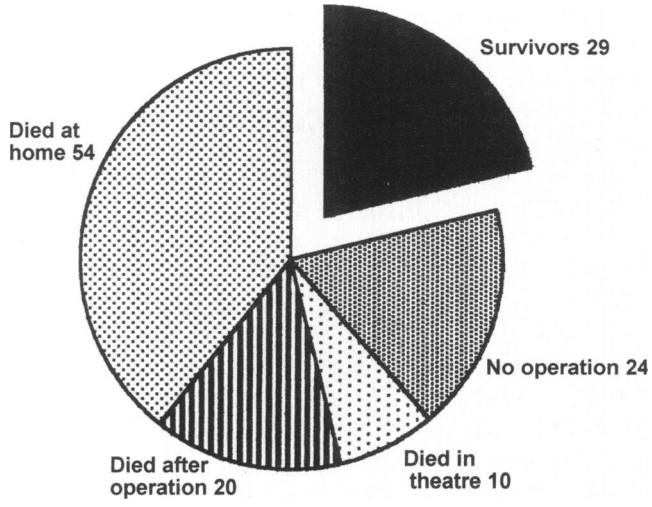

Figure 4. Outcome of RAAA showing survivors and non-survivors with place of death.

lack of local facilities. Both of these patients underwent an operation at the receiving hospital and subsequently died. A further 24 patients (22%) died without an operation, either in the A&E department or on medical or surgical wards. The reasons why no operation was performed were available in 10 of the 24 patients; the diagnosis was missed or late in four; three patients were moribund and one died during transit to theatre. In two patients, an active decision was taken not to intervene, one with a leaking thoracoabdominal aneurysm and another with disseminated colonic carcinoma.

Fifty-nine patients underwent an operation at Hinchingbrooke Hospital, of whom 29 survived to leave hospital. Ten died in theatre or in the recovery area and 20 died in ITU or on a surgical ward after operation. Forty-three operations were performed by a vascular surgeon (73%) and 14 by a general surgeon (24%) with survival rates of 56% and 43%, respectively.

Almost three-quarters of all RAAAs discovered died without an operation. The mean age of those surviving an operation was 74.1 years (SD 8.73 years) and of those dying after an operation was 74.4 years (SD 6.83 years).

Diameter of aneurysm at rupture

In 68 cases (49%), an estimate of the size of the aneurysm at rupture was available (Fig. 5). This was obtained from the surgeon's estimate of size at operation, the measured size at post-mortem and, in some cases, the size measured on CT or ultrasonography before operation. The mean diameter at rupture was 8.14 cm (SD 2.0 cm). In five cases (7.4% of those in which the diameter was recorded) the size of the ruptured aneurysm was < 6 cm. Estimates of size at operation were made by the vascular surgeon who operated on the majority of elective and ruptured aneurysms at Hinchingbrooke. While accepting that most of these dimensions are necessarily approximate, they do provide a rough estimate of the size at rupture.

Hospital stay

For those surviving an operation, the mean hospital stay was 18.4 days (SD 9.0 days) with an average of 4.8 days spent on ITU (SD 3.9 days).

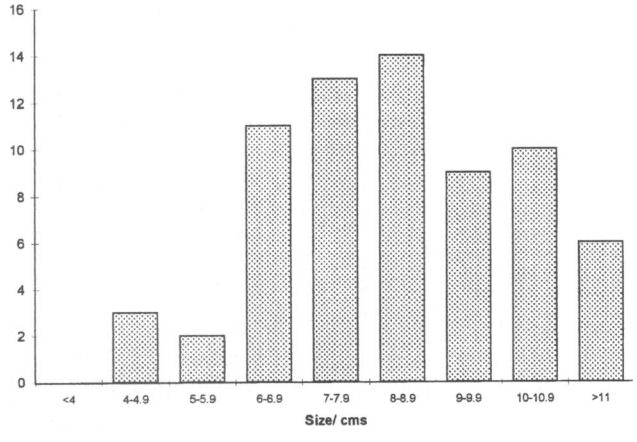

Figure 5. Size of AAA at rupture.

Elective AAA repairs

The number of elective operations for AAA at Hinchingbrooke rose from 41 between 1986 and 1990 to 77 between 1991 and 1995.

Discussion

During the 10-year period, 139 cases of RAAA were discovered, with an overall mortality of 79%. This is consistent with the 80–94% mortality quoted in other series *(6–9)*.

The overall incidence was six times greater in men than women, although this ratio declined to 2.25:1 in the 80–84 years age band.

Of the 139 cases of RAAA, only three came from outside the district. These have been included in our analysis because they may compensate for Huntingdon patients who died from a ruptured aneurysm while outside the district.

The true incidence of RAAA in this study is likely to have been underestimated to a small degree, since some patients who died of a RAAA in the community will have been known to have other co-morbid conditions, which could reasonably have been certified as the cause of death. However, we are in a privileged position to identify a high proportion of district ruptured aneurysms, since virtually all surgical emergencies were admitted to a single district hospital and virtually all community post-mortems were performed at the same hospital. In addition, the aneurysm screening programme involves all GPs in the district, and as a result the GPs and hospital staff are more 'aneurysm aware' and are perhaps more likely to consider RAAA as a cause of sudden death in the elderly. Furthermore, 56% of the male population over 50 years had been invited for screening by the end of the study period and 74% had attended for ultrasonographic examinations. Any man known to have an aneurysm, however small, was likely to have that incriminated if he died suddenly.

According to OPCS data for the district, only 67 people died of a RAAA between 1986 and 1995 (ICD9 441.3) (Office for National Statistics: Census, 1996, No. 1512). In our study we detected 110 patients who had died of RAAA during the same period, demonstrating the under-reporting of RAAA in national statistics and providing evidence that our figures are more likely to approach completeness in regard to local mortality for RAAA. The reasons for under-reporting in national statistics may be that OPCS figures are based on information on cause of death obtained from death certificates, which are often inaccurate. In addition, some ruptured abdominal aortic aneurysms are likely to have been erroneously included in the category of ruptured aortic aneurysms of unspecified site (ICD9 441.5). There was a total of 26 such cases during the study period. This seems to be a disproportionately large number, since ruptured aortic aneurysms apart from abdominal or thoracic aneurysms are relatively rare.

We found that the background incidence of RAAA in Huntingdon is similar to that found in other community studies in England and Wales *(8–10)*. However, we did not see a rising incidence of RAAA in males during the decade studied, unlike that found in some of these studies. The national trend, as revealed in OPCS statistics, is also a rise in RAAA, year on year. Similarly, in the neighbouring health district of Kettering, there was a rise in the number of RAAAs from 35 in the earlier 5-year period (1986–1990) to 64 in the later 5-year period (1990–1995) (Office for National Statistics: Census, 1996, No. 1512). Despite the rise in the over 50 years male population in Huntingdon district between 1986 and 1994, from 13 959 to 16 121, there was a fall in the absolute numbers of RAAA between the two 5-year periods. The over 50 years female population rose from 16 121 to 19 940 over the same period and the absolute number of RAAA in females also rose (Table I). The contrary trend among males in Huntingdon district compared with national figures and published local figures elsewhere is most likely to be explained on the basis of a beneficial effect of aneurysm screening for males. This beneficial effect has been clearly demonstrated in a recent study, in which screening for AAA in the over 50 years male population caused a 50% reduction in incidence and subsequent mortality in the Huntingdon district *(5)*.

As expected, the incidence of RAAA rose with increasing age in men and women. This occurred at an older age in women (above 80 years) than men (above 65 years). However, it is important to note that ruptured AAA also occurred in younger age groups, with 15 ruptures occurring in men under the age of 65 years, 12.6% of the total. This has implications for the age of starting screening for AAA, suggesting that earlier screening may be indicated if local elective operative mortality is low.

Almost three-quarters of all deaths occurred in patients who did not have an operation and about one-half of all deaths occurred in the community. Previous studies have reported proportions of between 35% and 64% dying at home *(7,9,10)*. In our study, the remaining deaths (22%) occurred in hospital during resuscitation, in medically unfit patients unsuitable for operation or where the initial diagnosis was incorrect or delayed.

Of those who reached the operating theatre, approximately 48% survived to leave hospital. Most operations (73%) were performed by surgeons with an interest in vascular surgery, who achieved slightly better survival figures than general surgeons (56% *versus* 43%). Our postoperative mortality was similar to that reported in other studies *(4,11)* although some specialised vascular units publish an operative mortality rate of 35% or less *(13)*.

An estimate of the diameter of the ruptured aneurysm was available in about 50% of cases. We accept that the estimates of AAA diameter made during operations were at best approximate but were likely to be consistent as they were based on the observations of a single experienced vascular surgeon.

Interestingly, 4.5% of all ruptures occurred in aneurysms < 5 cm in diameter and 7.4% in those < 6 cm. This confirms that small aneurysms occasionally rupture below the 5–6 cm threshold for operation still employed by most British surgeons *(12)*.

In conclusion, we found the overall mortality of RAAA in the Huntingdon district was 79%. Three-quarters of all deaths occurred in patients who did not reach the operating theatre. Of all ruptures, 7.4% occurred in AAAs < 6 cm in diameter and 12.6% occurred in men under the age of 65 years.

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