Fate of the Ectatic Infrarenal Aorta: Expansion Rates and Outcomes

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The natural history of the ectatic infrarenal aorta remains undetermined. While surveillance protocols have been proposed for true aneurysms, no recommendations are currently available for ectatic aortas. The purpose of this study is to define the natural history and recommend surveillance protocols for the infrarenal aorta 2.5-2.9 cm in diameter. Screening of 12,500 yielded 223 patients with an infrarenal abdominal aorta 2.5-2.9 cm in diameter at a university-affiliated VA medical center. All patients were prospectively followed by ultrasound from August 1993 through October 2000 and expansion rates were calculated by comparing the first and last study. Multivariate analysis of risk factors classically associated with abdominal aortic aneurysm was performed. Current data suggest that ectatic infrarenal aortas expand slowly, do not rupture, and rarely meet criteria for operative repair. No risk factors linked to the development of aneurysms were identified. On the basis of this study we recommend that patients with ectatic aortas have a repeat ultrasound 5 years after the initial study.

INTRODUCTION

Ruptured abdominal aortic aneurysm (AAA) represents the 13th leading cause of death in the United States, with an overall mortality of around 90%. In contrast, the mortality of patients who reach the emergency room is estimated to be 50%. This compares poorly to the mortality related to elective AAA repair, currently reported to be between 2% and 5%. These alarming numbers represent the basis for screening programs aimed at the high-risk population. While the main advantage of such screening is the ability to detect AAA meeting the criteria for surgical repair, most of the studied aortas are found to be either ectatic or too small to justify any form of intervention. However, aneurysmal expansion clearly occurs over time, and re-screening programs or follow-up protocols need to be implemented to select the patients who will benefit from aneurysm repair.

Conclusions from the UK Small Aneurysm Trial1 and the Aneurysm Detection and Management (ADAM) Trial2 have enabled clinicians to establish evidence-based recommendation for the management of the 4 to 5.5 cm AAA. Further analysis of the ADAM Trial data led to recommendations for small 3 to 3.9-cm AAA. To date, little is known of the natural history of the ectatic aorta with a diameter between 2.5 and 2.9 cm. The purpose of this study is to define the expansion rates and outcomes of ectatic aortas and make recommendations for an efficient and cost-effective surveillance protocol.
**PATIENTS AND METHODS**

Patients screened for the Aneurysm Detection and Management (ADAM) Trial at the Veterans Affairs Medical Center in Minneapolis found to have an aortic diameter between 2.5 and 2.9 cm were prospectively followed by yearly serial ultrasonography. Since the ADAM Trial randomized either to surgical repair or surveillance-only patients with AAAs between 4 and 5.4 cm, all patients with a 2.5 to 2.9-cm AAA were followed separately and underwent at least one subsequent ultrasound no less than 1 year after the initial screening study, which occurred between December 1992 and November 2000. Aortic measurements were made in both the anterior-posterior and transverse planes and the greatest diameter was recorded. Expansion rates were determined by computing the diameters of the first and last study for each patient.

In addition, all patients were required to complete a questionnaire to capture demographics and risk factors. Endpoints for the small AAA study were (1) aortic expansion to AAA, (2) no expansion, (3) all causes of death, (4) AAA rupture, (5) expansion ≥4 mm/year, and (6) surgical repair. Risk factors included for multivariate analysis were age, initial aortic diameter, family history of AAA, smoking history, cardiovascular disease, peripheral vascular disease, diabetes, hypertension, hypercholesterolemia, and ratio of infrarenal to proximal diameter. A multivariate logistic regression analysis was performed using SPSS software (SPSS Inc., Chicago, IL) to analyze risk factors contributing to AAA development.

**RESULTS**

A total of 223 patients with aortic diameters between 2.5 and 2.9 cm were identified among 12,500 screened patients; all had had at least one subsequent ultrasound 1 year after the initial screening study. The incidence of ectatic aortas among the screened population was 1.8%. Demographics and risk factors are presented in Table I. The mean aortic diameter was 2.7 ± 0.13 cm and the average follow-up was 5.9 ± 1.3 years. During this follow-up period, eight patients died and the cause of death was determined by death certificate in all. No autopsy was performed. Causes of death were described as malignancy in three and cardiovascular in five. No AAA ruptures were documented.

The mean expansion rate was 0.13 ± 0.15 cm/year, however, the expansion rate among ectatic aortas that developed into true aneurysms was 0.19 ± 0.15 cm/year. No expansion was observed in 37% of the 2.5 to 2.9-cm aortas. One hundred and forty-one (63%) patients developed a true aneurysm (diameter >3 cm). Size distribution among the ectatic aortas that became aneurysmal is presented in Table II. Rapid expansion (>4 mm/year) was observed in 8% of the overall group. Multivariate logistic regression analysis did not identify any risk factors associated with the risk of AAA development. The sample size of patients with rapid expansion did not allow for a conclusive multivariate regression analysis.

Expansion to AAA ≥3 cm was not related to the length of follow-up. The mean follow-up for patients who developed an AAA was 5.63 ± 1.36 years, compared to 6.55 ± 1.03 years for patients whose AAA did not expand.

During the follow-up period no patient underwent surgical repair. At last follow-up, two patients met our criteria for elective repair (AAA ≥5.5 cm)—one with a 6.5-cm AAA who refused surgical intervention, and the other with a 5.9-cm AAA, is a 83-year-old man with dementia.

**DISCUSSION**

Our data indicate that 63% of ectatic aortas become aneurysmal over a period of 6 years. However, the majority expand slowly (0.13 cm/year) and only a fraction (2%) will require surgical intervention. During this study, no patient suffered an AAA rupture, according to death certificates. This study...