ELSEVIER

Acceptable Risk but Small Benefit of Endovascular Aneurysm Repair in Nonagenarians

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Background: We report the outcomes of a single-center experience with endovascular aneurysm repair (EVAR) in nonagenarians.
Methods: Via a retrospective medical records review, we identified all patients ≥90 years old who underwent EVAR at a single university teaching hospital during a 5-year period (January 2004 to December 2008). Patients were evaluated for surgical risk factor profile, preoperative imaging, technical success, postoperative complications, length of hospital stay, and need for secondary intervention. In addition, mortality rates were evaluated at 30 days, 365 days, and 2 years.
Results: There were 18 nonagenarians (12 male, 67%) with a mean age of 91.2 years (range 90-95). Each patient averaged 3.5 risk factors, and the mean preoperative maximal aneurysm size was 68.3 mm (range 50-105). Sixteen (89%) patients were treated on an elective basis, and two patients were emergently treated for aneurysm rupture, with one undergoing aortouni-iliac stenting with femoral–femoral bypass. All other patients in the study had bifurcated stent grafts. There was 100% technical success with no need for open conversion. The mean length of hospital stay was 4.3 days with a mean intensive care unit stay of 0.6 days. Systemic complications occurred in three patients (17%) including one death within 30 days. Secondary interventions were required in two patients (11%). One had endovascular treatment of a type I endoleak at 4 months, and a second patient underwent femoral–femoral bypass at 25 months for severe flow-limiting limb angulation. Mortality rates were 5.6% at 30 days, 41.2% at 365 days, and 58.3% at 2 years. Mean survival of the 11 patients who expired beyond the first 30 days was 17.5 months (range 4-50). Of these, mean survival of the nine patients treated electively was 20.2 months (range 7-50). Mean survival of the six patients still alive is 25.6 months (range 8-65).
Conclusion: EVAR is safe in nonagenarians despite their advanced age and significant surgical risk factor profile. The procedure can be performed with excellent technical success and a low rate of perioperative complications. However, mortality rates after 30 days are significant. The substantial long-term mortality raises the question of possible treatment futility in this unique population. While age should not be a contraindication for EVAR, recommendations for the procedure should be based on individual patient selection.

INTRODUCTION

Nonagenarians are becoming an increasingly prominent part of our population. Based on U.S. Census estimates, the 85 years and older age group will more than triple in size over the next several decades.[1] As age is a significant risk factor in the development of abdominal aortic aneurysms (AAA), the diagnosis of AAA in nonagenarians will certainly rise concurrently. While elective repair

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can prevent rupture and death, the associated risks and morbidity must be carefully weighed against the patient's overall health and life expectancy. In nonagenarians, open surgical repair is often not a viable option because of the multiple health risk factors. Furthermore, advanced age in itself is an independent risk factor for perioperative death.[2]

Since the introduction of endovascular AAA repair (EVAR) in 1991 by Parodi and colleagues,[3] this procedure has become widely accepted as a safe and effective way of treating aneurysms located in the infrarenal portion of the aorta. Multiple clinical trials comparing EVAR with traditional open surgical repair have confirmed the perioperative benefits of EVAR.[4-8] Furthermore, there have been several studies demonstrating the benefits of EVAR in octogenarians.[9-11] However, there are very limited data regarding EVAR in nonagenarians. We therefore sought to evaluate the outcomes of EVAR in nonagenarians at a single university teaching hospital, with particular focus on technical success, perioperative outcomes, and long-term mortality results.

PATIENTS AND METHODS

A retrospective review of medical records was undertaken after obtaining approval from the university institutional review board. All patients aged 90 and above undergoing EVAR at the institution between January 2004 and December 2008 were identified. A total of 18 nonagenarians (12 males, 66.7%) were identified during the 5-year period. The mean age was 91.2 years (range 90-95) at the time of operation. The patients' surgical risk factors were reviewed, with hypertension in 16 (89%) patients, smoking history in 13 (72%), coronary artery disease in 11 (61%), peripheral vascular disease in eight (44%), malignancy in eight (44%), diabetes in three (17%), chronic obstruction pulmonary disease in two (11%), and chronic renal insufficiency in two (11%). The cohort averaged 3.5 surgical risk factors per patient. All patients were ambulatory at the time of operation. There were four patients with an American Society of Anesthesiologists (ASA) score of 4, 13 patients with an ASA score of 3, and one patient with an ASA score of 2. Eight patients had a history of previous abdominal operation (including appendectomy, colectomy, hysterectomy, enterolysis). All patients had preoperative imaging in the form of either contrast-enhanced computed tomography (CT) or magnetic resonance imaging. All aneurysms were limited to the infrarenal aorta, and the mean maximum aneurysm diameter was 68.3 mm (range 50-105). Sixteen (89%) patients were treated on an elective basis, while two presented with rupture. There was one patient who had a history of aortic intervention with prior EVAR with an Excluder graft (W. L. Gore & Associates, Flagstaff, AZ). This patient presented with rupture from a type I endoleak and was treated with aortouni-iliac stenting using a Renu endograft (Cook, Bloomington, IN) with femoral–femoral bypass.

All EVARs were performed in the operating room; 14 (78%) patients underwent general anesthesia with endotracheal intubation, and four (22%) had spinal anesthesia. Open surgical exposure of the bilateral femoral vessels was utilized, and imaging was performed with portable C-arm fluoroscopy. Endografts used included the following: 12 Zenith (Cook), three Excluder, two AneuRx (Medtronic, Santa Rosa, CA), and one Renu. Completion angiography was performed following deployment to confirm exclusion of the aneurysm sac. Clinical outcome parameters evaluated included the following: estimated blood loss (EBL), hospital length of stay (LOS), and intensive care unit (ICU) LOS. Follow-up after discharge included office visit and telephone follow-up as well as CT imaging. Mortality data were determined using a review of available medical records as well as information obtained from the Social Security Death Index.

In compliance with the reporting standards recommended by the Society of Vascular Surgery (SVS) and the American Association for Vascular Surgery, technical success was defined as successful introduction and deployment of the endograft without the need for conversion, mortality, type I or III endoleak, or graft limb occlusion within the first 24 hr. Clinical success requires successful deployment of the endovascular device without death as a result of aneurysm-related treatment, type I or III endoleak, graft infection or thrombosis, aneurysm expansion, rupture, or conversion to open repair. Type II endoleaks with absence of aneurysm expansion are considered as clinical success. All deaths that occur within 30 days of the operative procedure are classified as procedure-related. Deaths that occur after 30 days are considered as late deaths. Aneurysm-related deaths are defined as all deaths due to aneurysm rupture, a primary or secondary procedure, or surgical conversion.[12]

RESULTS

All 18 patients underwent EVAR, with technical success of 100%. Completion angiography