Endovascular Aneurysm Repair in Nonagenarians: A Systematic Review

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Background: Endovascular aortic aneurysm repair (EVAR) has been associated with a reduction in early morbidity and mortality compared with open surgery, creating an opportunity for aneurysm repair in those previously considered unfit for intervention. We determine the published incidence of complications and survival after elective EVAR in nonagenarians.

Methods: A systematic literature search was performed using the PubMed, EMBASE, and Cochrane databases up to December 2012. Two observers independently screened search results and extracted data.

Results: Six retrospective reports were identified including 361 patients (81% men) with a mean age of 91.6 years. The mean aneurysm size was 69 mm. Comorbidities include hypertension (81%), ischemic heart disease (50%), peripheral vascular disease (30%), and chronic obstructive pulmonary disease (20%). There was no intraoperative mortality, 22% of patients had perioperative medical or surgical complications, and 24% had endoleaks. Mean duration of hospital stay was 4 days. Thirty-day mortality was 5%, and survival at 1, 3, and 5 years was 82%, 56%, and 17%, respectively.

Conclusions: Although the complication rates and longer term survival after elective EVAR in carefully selected nonagenarians appear acceptable, they are higher than those reported in younger patients. Given the typical life expectancy, careful consideration should be given to individual cases before undertaking EVAR in the nonagenarian.

INTRODUCTION

Abdominal aortic aneurysms (AAAs) are relatively common with a prevalence of 1.4% in the United States.[1] Patients can present with a variety of symptoms ranging from unimpressive groin, flank, back, or abdominal pain to catastrophic cardiovascular collapse. Although symptoms of pain can be insidious in onset, many AAAs are asymptomatic, and the associated mortality with rupture is high. The prevalence of AAAs also increases with age.[2] As the population ages with improvements in medical care, more patients in the older age brackets will present with an AAA. The nonagenarian population (i.e., those older than 90 years) in the United States has recently been growing by around 50,000 per annum[3] to 2.1 million.[4] Similarly, in the United Kingdom in 2011, where the total population was estimated at 63 million, the number of nonagenarians was around 440,000, a 3-fold increase over the previous 30 years.[5]

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AAA repair can be achieved via an open or endovascular approach and aims to prevent rupture and subsequent morbidity and mortality. There are considerable risks to open operations, and patients older than 90 years are likely to have significant comorbidities, in addition to their age, which increase the risk of perioperative mortality.[6] Studies of endovascular aortic aneurysm repairs (EVARs) have suggested a reduced perioperative risk of this procedure when compared with open surgery[7] although, in patients not fit for surgery, endovascular repair may not improve all-cause mortality.[8,9] There are many reports with large numbers of patients suggesting that EVAR in octogenarians is acceptably safe and effective.[3,10,11] Some observational studies do report successful management of nonagenarians with AAA using EVAR, but such reports tend to report few cases, and thus, it is difficult to draw reliable conclusions.[12,13] In addition, a true successful outcome from EVAR should be interpreted with reference to the alternative outcome under conservative management. Given that the ultimate rationale for performing EVAR, at any age, is to prolong life expectancy, we aim to assess whether EVAR in nonagenarians can achieve this outcome.

To fulfill this aim, we performed a systematic review of the literature to elucidate the perioperative mortality, complication rate, and longer term survival of nonagenarians after EVAR.

METHODS

Data Sources

Two authors (S.S. and J.W.) independently performed a search of the databases MEDLINE (from 1988), EMBASE (from 1988), and the Cochrane Library. The year 1988 for the first search was chosen as this was the year in which (thoracic) stent grafts were first described by Volodos et al.[14] The search was performed in February 2014. A search using a combination of terms related to aneurysms (abdominal aneurysm OR abdominal aortic aneurysm OR AAA) AND endovascular repair (endovascular OR endoluminal OR EVAR OR stent) AND (nonagenarian*) was performed. All relevant studies were included (retrospective and prospective cohorts or case series and randomized controlled trials). We did not use a language restriction (although no non-English articles were subsequently found). The reference lists of retrieved articles were manually searched to look for further relevant studies. The grey literature (i.e., reports not published through conventional channels) was not included. We followed the objectives as set out by the Meta-analysis of Observational Studies in Epidemiology guidelines.[15]

Study Selection

Two authors (S.S. and J.W.) confirmed the eligibility of the identified studies (see following). Where there was a discrepancy, a decision was reached through mutual discussion with an arbiter (W.H.). All studies reporting perioperative mortality, complications, or longer term survival of nonagenarians undergoing elective EVAR were considered for inclusion. Duplicate publications, or those reporting on the same study population, were excluded. Articles on surgery only for ruptured aneurysms were also excluded as it was felt that data on this would be scant and would not be comparable to the elective setting.

Data Extraction and Analysis

Methodological quality was neither an inclusion nor exclusion criterion. Data on the following were extracted, where possible: authorship, publication year, number of patients, study design, aneurysm size, age, and sex. We also extracted data on 30-day or in-hospital mortality, complications, and survival. Data were considered missing if not explicitly mentioned in the text, and these were not included in the combined analyses. Where possible, data were pooled using weighted averages to give improved estimates, notwithstanding varying methodological quality and the likelihood of clinical heterogeneity between included studies. Combined outcomes were calculated using Excel (Office 2010; Microsoft, Redmond, WA).

RESULTS

From a total of 2,348 studies identified by our systematic search, 6 were relevant (Fig. 1).[16–21] All were retrospective reviews written in English. Five of these were performed in the United States and 1 in Germany. Although most reports provided data from a single institution, the largest study includes patients from a national database of the American College of Surgeons. This study included a review of open and endovascular AAA repair across all age groups (including nonagenarians).[20] Unfortunately, only some parameters could be extracted from this report (early perioperative complications, 30-day mortality, and length of stay). The other variables extracted from the remaining studies were age, aneurysm size, comorbidities, anesthesia type, intraoperative complications, on-table mortality,