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Treatment of Abdominal Aortic Aneurysm in Nine Countries 2005–2009: A Vascunet Report

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Abstract *Objectives:* To study contemporary treatment and outcome of abdominal aortic aneurysm (AAA) repair in nine countries.
Design and methods: Data on primary AAA repairs 2005–2009 were amalgamated from national and regional vascular registries in Australia, Denmark, Finland, Hungary, Italy, Norway, Sweden, Switzerland and the UK. Primary outcome was in-hospital or 30-day mortality. Multivariate logistic regression was used to assess case-mix.
Results: 31,427 intact AAA repairs were identified, mean age 72.6 years (95% CI 72.5–72.7). The rate of octogenarians and use of endovascular repair (EVAR) increased over time ($p < 0.001$). EVAR varied between countries from 14.7% (Finland) to 56.0% (Australia). Overall perioperative mortality after intact AAA repair was 2.8% (2.6–3.0) and was stable over time. The perioperative mortality rate varied from 1.6% (1.3–1.8) in Italy to 4.1% (2.4–7.0) in Finland. Increasing age, open repair and presence of comorbidities were associated with outcome.

7040 ruptured AAA repairs were identified, mean age 73.8 (73.6–74.0). The overall perioperative mortality was 31.6% (30.6–32.8), and decreased over time ($p = 0.004$).

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Conclusions: The rate of AAA repair in octogenarians as well as EVAR increased over time. Perioperative outcome after intact AAA repair was stable over time, but improved after ruptured repair. Geographical differences in treatment of AAA remain.

Introduction

Over the past decade, results of several important randomised controlled trials (RCTs) in treatment of abdominal aortic aneurysms (AAA) have set the ground for dramatic changes in management of this disease.[1—5] Whilst randomised clinical trials are essential for establishing the level I evidence for best medical care provided to patients, analysis of current clinical practice through national or regional databases is a necessary complement to this evidence. Analyses based on registry data have several advantages compared to RCTs.[6] They reflect every-day, often population-based, practice and not just the practice of centres of excellence. They can report on more than 90% of the operated patients,[7] compared to for instance only approximately 20% of the patients that were randomised in the centres participating in the EVAR1 Trial.[1] The results obtained from registries may therefore be more generalisable than results from RCTs. Registry data also give a much faster feedback and thus reflect contemporary as compared to often historical data from the RCTs. Thus, such retrospective analyses of large datasets render a possibility to understand how the results of randomised trials translate to broader medical practice. In addition, audits of this kind can serve as a basis for improvement through comparison.

In vascular surgery, there is a longstanding tradition of registering and analysing results of surgical practice on institutional, regional and national levels. International comparisons of vascular surgical procedures and outcomes have recently been presented through the vascular surgery database reports published by the Vascunet collaboration on behalf of the European Society of Vascular Surgery in 2007 and 2008.[8,9] The first Vascunet report analysed indications and patient selection for AAA treatment in five countries, while the second report broadened the scope to also include carotid reconstruction and outcome data. Despite discrepancies in data definition and validity of national databases, the reports indicated interesting differences between countries in the treatment of AAA.

The current report, which focuses on AAA, is part of the third analysis of the Vascunet database. Results of the analysis of carotid reconstruction and lower limb revascularization from the Vascunet database will be published separately. The aim of the current analysis is to evaluate indications, treatment strategies and outcome of AAA treatment in nine countries over a contemporary period of five years.

Materials and Methods

Data on primary AAA repairs were amalgamated from nine vascular registries for the period of 2005—2009, Table 1. The registries operated on a national level in Denmark, Hungary, Italy, Norway, Sweden and the United Kingdom. The registries in Australia and Finland covered hospitals in a specific geographical region, and the Swiss registry included AAA repairs performed at University hospitals and large public hospitals. An estimate of the percentage of AAA repairs performed in each country/region that are included in each registry as well as the presence or absence of internal and external validation procedures for the registries are presented in Table 1. Data from the full five year period were included from Australia, Denmark, Sweden and United Kingdom, whilst Norway and Switzerland reported data for 2005—2008, Finland and Italy for 2007—2009 and Hungary for 2008—2009. Variables included patient demographics (age, gender), comorbidities (heart, respiratory, and renal disease, hypertension, diabetes, smoking), operative data (date of operation, maximum diameter of the aneurysm, intact or ruptured repair, open or endovascular repair) and outcome data (30-day or in-hospital mortality).

The amalgamated data were analysed overall, per country and per operation year to evaluate national differences in patient demographics, comorbidities, operative data and outcome. Due to the differences in the participating registries, not all data were available from all countries, and there were minor differences in the definitions of the variables. The properties of the participating registries and the provided data are described in detail in Appendix 1. In-hospital or 30-day mortality was used as primary outcome depending on which data were provided in the separate national or regional databases. Co-morbidity data were based on the registered comorbidities as defined in the original databases except for renal disease. For this parameter, five countries presented data on presence of renal disease based on pre-set criteria that varied between registries (Appendix 1). Three countries reported the exact preoperative creatinine level, and in those a creatinine level $>$150 mmol/l was regarded as presence of renal disease.

To estimate the difference between in-hospital and 30-day mortality, data from the Swedish Vascular Registry (Swedvasc) 2000—2008 was analysed, as this registry included data on hospitalisation dates on most, and date of death for all AAA patients during this period. Date of death is registered with 100% validity due to cross-matching with the population registry. In-hospital as well as 30-day mortality rates were calculated for 63% of AAA patients registered in the Swedvasc registry over this period.

Statistical analysis

All continuous data are presented with mean and 95% confidence intervals. Rates are presented as percentages with 95% confidence intervals (CI). Time trends were analysed with the Cochran—Armitage test. Multivariate logistic regression models were used to estimate the odds ratios for various factors in relation to 30-day or in-hospital mortality.