

Outcome after Turndown for Elective Abdominal Aortic Aneurysm Surgery

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WHAT THIS STUDY ADDS

This study provides evidence of survival times and cause of death in those that are turned down for AAA repair in a UK population. Previous data on this have been provided as secondary outcomes in large interventional studies. It supports similar work done in other European nations, adding to a growing body of evidence that demonstrates the discrepancy in turndown rates between genders and the role for cardiopulmonary exercise testing and other means of objective physiological assessment in selection for surgery.

Objectives: The aim was to assess the survival of patients who had been turned down for repair of an abdominal aortic aneurysm (AAA) and to examine the factors influencing this.

Methods: This was a retrospective observational study of a prospectively maintained database of all patients turned down for AAA intervention by the Black Country Vascular Network multidisciplinary team (MDT) from January 2013 to December 2015. Data on AAA size, cardiopulmonary exercise testing (CPET) and cause of death were recorded.

Results: There were 112 patients. The median age at turndown was 83.9 years (IQR 10.2 years). The median AAA size at turndown was 63 mm (IQR 16.7 mm). The median follow-up time after turndown was 324 days (IQR 537.5 days). Sixty-four patients (57.1%) were deceased after 2 years, with a median survival time of 462 days (IQR 579 days). Patients who died had a significantly larger AAA dimension (median 65 mm, IQR 18.5 mm) than those surviving to date (median 59 mm, IQR 10 mm, $p = .004$). Using Cox regression analysis, the probability of 1 year survival in the whole population was 0.614. The probability of 2 year survival was 0.388. When accounting for age, gender, AAA dimension, and British Aneurysm Repair risk score, no factors had significant influence over survival. Of the 64 deceased patients, 30 had an accessible cause of death: 36.7% of these were due to ruptured AAAs. There was no significant difference in AAA size between those dying of ruptures and those dying of other causes ($p = .225$, mean 74 mm and 67 mm respectively).

Conclusions: Being turned down for AAA repair carries a significant short-term risk of mortality. Those turned down for repair carried significant levels of comorbid disease but no factors considered were found to be independently predictive of the length of survival.

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INTRODUCTION

Abdominal aortic aneurysms (AAAs) in the United Kingdom (UK) have an estimated prevalence of 1.34% in men and 0.31% in women but this has been declining in recent years.^{1–3} As radiological investigation over the past 20 years has increased, so too has the detection of incidental AAAs. Now with the introduction of the national abdominal aortic aneurysm screening programme (NAAASP) in 2009 the hope

is the majority of aneurysms will be detected early and decisions regarding their treatment can be made in the asymptomatic phase.^{4,5}

Surgical repair of AAAs, whether by open or endovascular surgery, carries significant risk of peri-operative and post-operative mortality (1.1–7.0%).^{1,6–8} The UK small aneurysm trial established that 5.5 cm was the threshold where the risk of intervention for an AAA outweighed the risk of death from rupture; this figure is a nationally accepted threshold for AAA intervention.^{1,9} Various risk factors influence peri-operative mortality, these include increased age, decreased renal function, respiratory disease, and positioning of the aortic clamp during surgery (a decision based on the anatomy of the aneurysm).¹⁰ Traditionally, a

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decision to not offer AAA repair (“turndown”) was based on a clinical judgement after an assessment of multiple comorbidities.¹¹ More recently, the use of cardiopulmonary exercise testing (CPET) has helped to quantify the physiological reserve of these patients and their mortality risk during AAA surgery. Poor performance in CPET, particularly anaerobic threshold (AT) and peak VO_2 (maximum oxygen consumption during exercise; aerobic capacity), have been shown to predict 30 day mortality in AAA repair.^{12,13}

The Endovascular Aneurysm Repair (EVAR) Trial 2 demonstrated that those judged clinically to be unfit for open surgery had no increase in survival when randomised to either EVAR or turndown. It demonstrated a survival probability of 66% after 4 years in turndown patients, with the majority of these death not attributable to aneurysm related mortality.⁷ Subsequent retrospective studies have demonstrated a significant cause of death in turndown patients to be rupture of their AAA, approximately 40%.¹⁴ There has also been a suggested link between aneurysm size and likelihood of rupture but this varies between studies. Additionally there are data demonstrating that those with larger diameter AAAs will rupture sooner than those with small diameters.¹⁵

The objective of this study was to determine the survival rates of patients not offered either open or endovascular surgery at one tertiary vascular centre in the UK. The secondary aims were to examine the factor influencing survival enabling accurate planning of resources.

MATERIALS AND METHODS

The Black Country Vascular Network is a tertiary vascular centre covering areas northwest of Birmingham (Dudley, Wolverhampton, and Walsall, UK). The population of these districts at the 2011 census was 831,718.¹⁶

All patients considered for AAA repair in the Black Country Vascular Network are discussed at a multidisciplinary team (MDT) meeting at the Vascular Hub. The MDT consists of vascular surgeons, vascular interventional radiologists, and vascular specialist anaesthetists. These patients were mostly referred because of the NAAASP or incidental findings from investigation for other reasons. All patients have cross sectional imaging available during the discussion and if needed they can be referred for further investigation prior to a decision to treat or not. This includes referral for CPET. All patients finally deemed not for operative management of their AAA or declining surgery for personal reasons are entered on to a prospectively collected “turndown list” along with demographic details, reasons for turndown, and aneurysm size. Once placed on the turndown list these patients are (in the vast majority) not considered for any intervention in either an elective or emergency situation. They are thereafter not routinely followed up by vascular services.

Retrospective analysis of all patients entered into the database from January 2013 to December 2015 was conducted to determine survival and where available cause of death. Cause of death was obtained by clinical letters or death certification. Death certificates were only available if the death was registered through a hospital mortuary.

Where cause of death data were missing, attempts were made to contact local coroners for this information. Data were combined with prospectively collected records of all CPET testing when it had been carried out. Where possible, an attempt was made to risk score patients retrospectively using the British Aneurysm Repair (BAR) score. This is an independently validated risk score for in hospital mortality following repair.¹⁷ This is not normally part of practice in the unit and scores were not considered in the decisions to offer surgery. The BAR score was calculated using the latest available blood results (within 6 months of the decision to turndown) and included serum sodium, serum leucocyte count, serum creatinine, the presence of ischaemic heart disease or heart failure, the presence of abnormal electrocardiogram, American Society of Anaesthesiologist (ASA) operative risk grading, axial dimension of aneurysm, and the presence of previous aortic surgery.

All patients had records reviewed in January 2017. Therefore, all patient had a minimum of 2 years’ follow-up.

Internal ethical approval was granted from the clinical governance department governing the Black Country Vascular Network. All continuous data were tested with the Shapiro—Wilks for normality (and were non-parametric) and significance was tested using the Mann—Whitney U test. Categorical data were tested with the chi-square test for significance or the Fisher exact test if there were low numbers in one or more groups. Survival analysis was conducted using Cox regression analysis. The Statistical Package for Social Sciences, Version 22 (Chicago, IL, USA) was used for this analysis.

RESULTS

Between January 2013 and December 2015, 137 patients were entered on the turndown list. Within 2 years of the study period, 58.4% had died ($n = 80$).

MDT outcomes

One hundred and five patients on the turndown list were discussed at the MDT meeting. The rest were placed there following acute referrals. Within the study period, 453 patients were discussed at the MDT meeting, with 301 elective AAA repairs recorded on the National Vascular Register (NVR) for the Black Country Vascular Hub. These were all discussed at the MDT meeting. Alternative outcomes from the MDT meeting included further surveillance ($n = 38$), further investigations or specialty opinions ($n = 6$), and being listed for a procedure that did not repair the AAA ($n = 3$). Table 1 displays the breakdown of turndown and operative management by gender. There was a significantly greater proportion of females turned down than were operated on electively ($p < .001$).

Table 1. Overall turndown rate by gender.

| Gender | Total (%) | Male (n) (%) | Female (n) (%) |
|------------------------|------------|--------------|----------------|
| Turndown | 137 (30.2) | 102 (74.4) | 35 (25.5) |
| Listed for operation | 301 (66.4) | 266 (88.4) | 35 (11.6) |
| Total discussed at MDT | 453 | 388 (85.7) | 65 (14.3) |

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