Rupture rates of untreated large abdominal aortic aneurysms in patients unfit for elective repair

Fran Parkinson, MB BCh,[a] Stuart Ferguson, MB BChir,[a] Peter Lewis, MB BCh,[a] Ian M. Williams, MD,[b] and Christopher P. Twine, MD,[a] for the South East Wales Vascular Network, *Newport and Cardiff, United Kingdom*

Background: **Elective abdominal aortic aneurysm (AAA) surgery relies on balancing the risk of the intervention against the risk of the aneurysm causing death. Although much is known about intervention at 5.5 cm, little is known about the fate of the patient unfit for elective surgery at this threshold. Medical therapy and endovascular surgery have revolutionized management of aortic aneurysms in the last 20 years and are thought to have affected rupture rates.**

Methods: **MEDLINE via PubMed, EMBASE, and the Cochrane Library Database were searched for studies reporting follow-up of untreated large AAA approach from inception to January 2014. Data were pooled using random-effects analysis with standardized mean differences and 95% confidence intervals (CIs) reported. The primary end points were rupture rates and all-cause mortality per year by AAA size.**

Results: **The search strategy identified 1892 citations, of which 11 studies comprising 1514 patients experiencing 347 ruptured AAA were included. The overall incidence of ruptured AAA in patients with AAA >5.5 cm was 5.3% (95% CI, 3.1%-7.5%) per year. This represented cumulative yearly rupture rates of 3.5% (95% CI, −1.6% to 8.7%) in AAAs 5.5 to 6.0 cm, 4.1% (95% CI, −0.7% to 9.0%) in AAAs 6.1 to 7.0 cm, and 6.3% (95% CI, −1.8% to 14.3%) in AAAs >7.0 cm. There was no heterogeneity between studies (I^2 = 0%). Only 32% of these patients were offered repair on rupturing an AAA, with a perioperative mortality of 58% (95% CI, 32%-83%). The risk of death from causes other than AAA was higher than the risk of death from rupture.**

Conclusions: **Rupture rates of untreated AAA were lower than those currently quoted in the literature. Non-AAA-related mortality in this group of patients is high. (J Vasc Surg 2015;61:1606-12.)**

Elective abdominal aortic aneurysm (AAA) surgery relies on careful risk balancing. The risk of aneurysm rupture and death needs to be balanced against perioperative risk and an expectation of individual long-term survival. Without accurate numbers for this risk, the decision to intervene for a specific patient is flawed and runs the danger of being of higher risk than not treating the AAA with surgery. Randomized data to support the threshold of repair at 5.5 cm exist,[1] and a contemporary rupture risk for patients with AAA <5.5 cm is known.[2] However, contemporary rupture rates for patients with AAA >5.5 cm, unfit for surgical intervention, is unknown. Up to 10% of patients presenting with an AAA will fall into this category.[3-5] Since the first epidemiological report in the 1970s,[6] little has been published, and the last meta-analysis was performed in the mid-to-late 2000s.[7,8] Surgeons therefore rely on historical data when balancing the risk of rupture and death with the risk of intervening for a specific patient.

Rupture rates of AAA >5.5 cm left untreated were lower than expected in the Endovascular Aneurysm Repair and Outcome in Patients Unfit For Open Repair of Abdominal Aortic Aneurysm (EVAR 2) randomized trial.[9] Medical management including statins, antiplatelet agents, and antihypertensives[10,11] are all now commonly used in patients with AAA and are thought to reduce rupture risk. A contemporary rupture rate for patients unfit for intervention at 5.5 cm is important for surgeons to accurately reconsider intervention at a larger size, if at all. Perioperative mortality can be predicted easily using the vascular Physiological And Operative Severity Score for Enumeration of Mortality and Morbidity (POSSUM) score,[12] or another predictive tool. If an accurate rupture rate is known, a decision to reset the intervention threshold may be made for individual patients. The aim of this systematic review was to determine the contemporary rupture rates of AAA >5.5 cm in patients unfit for repair at 5.5 cm.

From the Department of Vascular Surgery, Royal Gwent Hospital, Newport[a]; and the Department of Vascular Surgery, University Hospital of Wales, Cardiff.[b]

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Reprint requests: Christopher P. Twine, MD, Department of Vascular Surgery, Royal Gwent Hospital, Newport NP20 2UB, UK (e-mail: christopher.twine@wales.nhs.uk).

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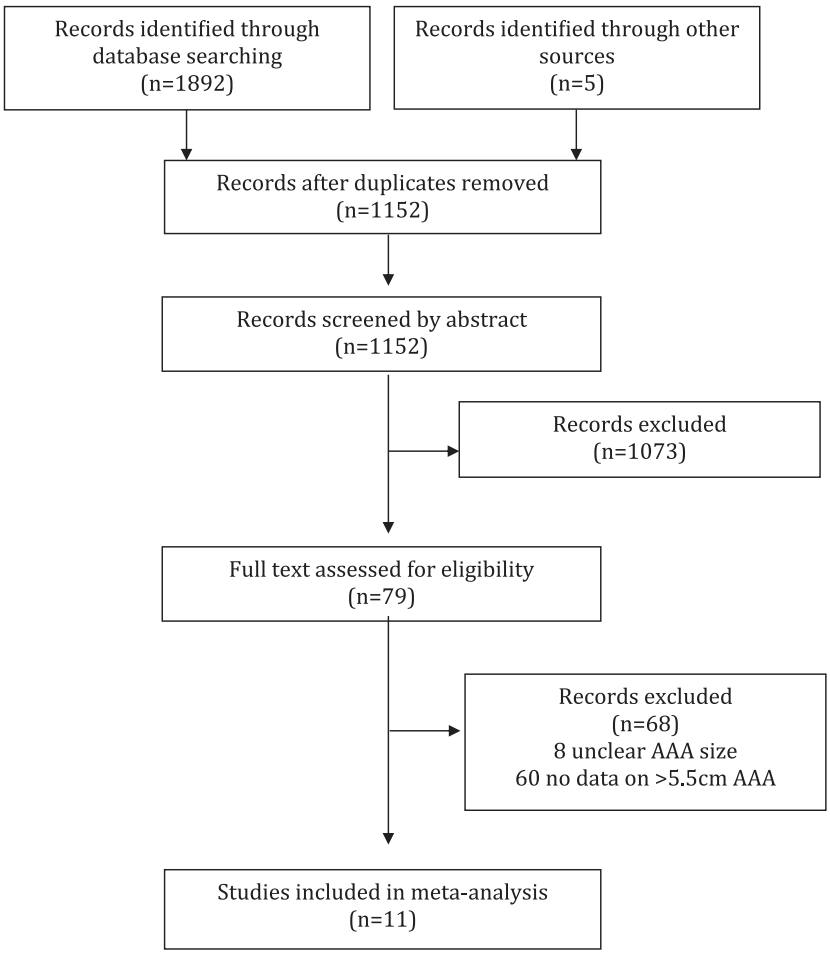

Fig 1. Identification process for eligible studies. *AAA*, Abdominal aortic aneurysm.

METHODS

Data sources, search strategy, and selection criteria. A systematic review of published work was conducted by using the protocol specified by the Cochrane collaboration[13] and reported in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement for the conduct of meta-analyses of intervention studies.[14] The following sources were searched: MEDLINE via PubMed (from inception to January 2014); EMBASE (same date restriction), and the Cochrane Library Database (Cochrane Central Register of Controlled Trials; same date restriction) for studies reporting follow-up of untreated large AAAs. There was no limitation on publication type or language. The following medical subject headings (MeSH) were used: "Abdominal aortic aneurysm," "Aortic aneurysm, ruptured," and "Risk assessment." The terms "aortic aneurysm diameter" and "rupture rate" were also used. The *British Journal of Surgery*, *Journal of Vascular Surgery*, and *European Journal of Vascular and Endovascular Surgery* Web sites were searched individually. The ClinicalTrials.gov Web site was also searched for randomized controlled trials involving the abdominal aorta.

Articles were also identified by hand searching of references and extensive use of the related articles function in PubMed. The related articles results were additionally cross-referenced with full results from previous searches. The last search date was September 18, 2014.

Data extraction. Data were extracted independently by two authors (F.P., C.P.T.). The following information was extracted from each study: first author, year of publication, study design (prospective, randomized, or other), number of participants in each group, duration of follow-up, inclusion criteria, quality of study, and outcome events.

Statistical analysis. Raw data were extracted from studies and rupture rates recalculated to standardize across studies. The pooled estimated mortality and rupture rates were calculated using generic inverse-variance random-effects meta-analysis, with standardized mean differences and 95% confidence intervals (CIs) quoted. Heterogeneity was expressed with the I^2 statistic. RevMan[15] was used for statistical analysis.