

REVIEW

Screening for Abdominal Aortic Aneurysm During Transthoracic Echocardiography: A Systematic Review and Meta-analysis

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WHAT THIS PAPER ADDS

Patients undergoing transthoracic echocardiography (TTE) probably have a cardiovascular risk profile similar to that of patients with abdominal aortic aneurysm (AAA) and may represent a group with a higher prevalence of AAA. The feasibility of estimating the prevalence of AAA during screening with TTE was investigated by conducting a systematic review and meta-analysis. The data suggest that targeted screening in this population may be beneficial where population based screening programs are not available. Opportunistic screening may also be considered in the light of the declining incidence of AAA. Further research is required to investigate the clinical benefits of screening in this setting.

Background: Screening for abdominal aortic aneurysm (AAA) during transthoracic echocardiography (TTE) may be an effective targeted screening strategy.

Objective: The aim was to assess the feasibility of AAA screening during TTE and to estimate the prevalence of AAA in patients undergoing TTE.

Methods: Electronic bibliographic sources were interrogated using a combination of free text and controlled vocabulary searches to identify studies reporting on AAA screening during TTE. The review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement standards. Fixed effect or random effects models were used to calculate pooled prevalence estimates.

Results: Twenty observational cohort studies were identified reporting a total of 43,341 participants (23,291 men and 20,050 women). Hypertension was reported in 41% (95% CI 38–43), hypercholesterolemia in 31% (95% CI 29–32), diabetes mellitus in 20% (95% CI 19–22), and tobacco use in 37% (95% CI 35–38). The aorta was visualised in 86% (95% CI 84–88) of the screened population. The pooled prevalence of AAA in the entire screened population was 0.033 (95% CI 0.024–0.044). The pooled prevalence of AAA in men was 0.046 (95% CI 0.032–0.065) and in women it was 0.014 (95% CI 0.008–0.022). The mean age of participants in whom an AAA was detected ranged across the studies from 66 to 85 years. The mean diameter of the aneurysm identified ranged across the studies from 35 mm to 45 mm. Clinical outcomes in participants with a detected AAA were poorly reported.

Conclusions: Screening for AAA during TTE may identify a population group with a high risk of AAA in whom targeted screening may be beneficial. Further research is required to investigate the cost-effectiveness and clinical benefits of AAA screening in this setting.

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INTRODUCTION

Abdominal aortic aneurysm (AAA) is a serious condition mainly encountered in the aging population of Western societies; it is associated with a significant morbidity and mortality in the event of rupture.^{1,2} The US Preventive

Services Task Force recommends one time screening for AAA by ultrasonography in men 65–75 years who have ever smoked.³ The Society for Vascular Surgery (SVS) recommends one time ultrasound screening for all men at or older than 65 years and as early as 55 years if there is a family history of AAA, and one time ultrasound screening for all women at or older than 65 years with a family history of AAA or who have smoked.⁴ The European Society for Vascular Surgery (ESVS) guidelines, recommend population screening for older men, and for older women with a family history of AAA.⁵ The guideline recommendations are based on high level evidence from large scale population screening studies, including the Multicentre Aneurysm Screening Study MASS (UK),⁶ the West Australian Aneurysm Screening Study,⁷ the Chichester study (UK),² and the Viborg Study (Denmark),⁸ which have demonstrated that screening for AAA decreases overall mortality. Furthermore, a pooled analysis of trial data found a significant reduction in aneurysm related and overall mortality in men after 3–5 years.⁹ The same meta-analysis found a significant increase in elective surgery for asymptomatic AAA resulting from population based screening and a significant decrease in emergency surgery for AAA.⁹ Abdominal ultrasonography is a non-invasive, highly sensitive, and cost-effective tool for AAA screening, with a reported visibility of 97.5–100% and diagnostic specificity close to 100%.¹⁰

Since there is emerging evidence to suggest that the incidence of AAA has decreased, mainly due to reduced smoking rates and modification of atherosclerotic risk factors,¹¹ targeted AAA screening of high risk populations may be more cost-effective.

The feasibility of AAA screening during transthoracic echocardiography (TTE) has been reported in several studies.^{12–16} Patients referred for echocardiography are thought to have cardiovascular risk factors which have been shown to be associated with AAA.¹⁴ Detection of AAA using TTE would involve few additional resources, as the same probe can be used to scan the aorta, which can be examined with the patient in the same position as for TEE. Considering that patients who undergo TTE have cardiovascular comorbidities, the prevalence of AAA in this group is speculated to be higher than that in the normal AAA screening population. The objective of the present review and meta-analysis was to assess the feasibility of AAA screening during TTE and to estimate AAA prevalence in patients undergoing TTE.

MATERIALS AND METHODS

Design

The review conformed to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement standards.¹⁷ The objectives, selection criteria, outcome measures, and methods of analysis were specified in a study protocol, which was registered at the International Prospective Register of Systematic Reviews in Health and Social Care (CRD42017056286).¹⁸

Eligibility criteria

Observational cohort studies reporting on screening for AAA during TTE were considered. Studies that provided adequate information on methods and techniques of the screening test were included. Eligible studies should also provide information on the prevalence of newly detected AAA in the screened population.

Participants of any age and gender who were screened for AAA during TTE performed for known or suspected cardiac disease were considered. Participants who were known to have an AAA and those with previous AAA repair were excluded.

The primary outcome measure was the prevalence of newly detected AAA in the screened population. Baseline demographics and cardiovascular risk factors in the studied populations were recorded.

Information sources and literature search strategy

Studies were identified by searching electronic bibliographic databases and scanning reference lists of articles. The following electronic bibliographic sources were searched: PubMed/MEDLINE, SCOPUS, and the Cochrane Central Register of Controlled Trials (CENTRAL). Relevant terms to identify eligible reports were selected. The following MeSH terms and key words were used: “aortic aneurysm, abdominal”; “aortic aneurysm”; “screening”; “transthoracic echocardiography”; and “echocardiography”. Thesaurus headings, search operators, and limits in each of the above databases were adapted accordingly. The last search was run in May 2017. No language constraints were applied.

Study selection and data management

Eligibility assessment of identified studies was performed by two authors (C.A., N.K.). A data extraction sheet was developed, and it was pilot tested in randomly selected studies that met the inclusion criteria, and it was refined accordingly. One author (C.A.) extracted relevant information from selected studies. A second review author (N.K.) cross checked the data that were extracted from the studies. Study related information was collected: study design and year of publication; baseline demographics and clinical characteristics of the entire screened population and the group of participants in whom an AAA was detected; and outcome data, as outlined in the “Eligibility criteria” section.

Risk of bias assessment

The methodological quality of observational cohort studies was assessed with the Newcastle–Ottawa scale (NOS).¹⁹ Using the tool, each study was judged on eight items, categorised into three groups: the selection of the study groups; the comparability of the groups; and the ascertainment of outcome of interest. Stars awarded for each quality item served as a quick visual assessment. Stars were awarded such that the highest quality studies were

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