



Review

The association of obesity with abdominal aortic aneurysm presence and growth



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ABSTRACT

Objectives: The importance of obesity as a risk factor for atherothrombosis has been clearly demonstrated. Abdominal aortic aneurysm (AAA) is believed to develop due to mechanisms distinct from atherosclerosis. The aim of this systematic review was to critically assess published evidence examining: (1) the association of obesity with AAA presence; (2) the association of obesity with AAA growth.

Methods: Studies investigating the association of markers of obesity with AAA were identified by searching the PUBMED database and hand searching of article reference lists. To be eligible for inclusion studies had to report a recognised measure of adiposity, i.e. body mass index, waist circumference or an imaging technique to quantify adipose distribution. AAA presence and progression also had to be reported and assessed by ultrasound or computed tomography. Eight eligible studies assessed the association of obesity with AAA presence; and two studies which assessed the association of obesity with AAA growth were included.

Results: Of the eight studies that examined AAA presence, five studies examined body mass index (BMI) and three studies measured waist circumference (WC). Three of five studies reported that BMI was positively associated with AAA presence or increasing abdominal aortic diameter. Two of three studies reported that WC was positively associated with AAA presence or larger abdominal aortic diameter. Three of the included studies utilised secondary measures of adiposity: waist-to-hip ratio (WHR), ultrasound assessment of adiposity and bioimpedence testing. Of these, only WHR was found to have a significant positive association with AAA presence. Of the two studies assessing the association of obesity with AAA growth both reported no association between BMI and AAA progression.

Conclusion: The reviewed studies suggest that anthropometric measures of BMI and WC are associated with AAA presence. Currently there is no convincing data that obesity is associated with AAA growth but further studies employing more detailed anthropometric measures are needed.

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1. Introduction

The incidence of obesity continues to increase in most countries [1]. According to the European Association for the Study of Obesity, the prevalence of obesity in Spain is 24.4% in males and 21.4% in females. This rate is comparable to that reported in other European Union member countries [2].

According to the World Health Organisation, worldwide obesity has more than doubled since 1980 [1]. A recent study of adult body mass index (BMI) in 199 countries revealed an increase in mean BMI of 0.4 kg/m² per decade since 1980 [3]. Obesity is an established risk factor for cardiovascular disease [4]. Markers of visceral adiposity in particular have been independently associated with the severity and prognosis of coronary and lower limb atherosclerosis [4]. Abdominal aortic aneurysm (AAA) shares many risk factors with occlusive vascular disease however there are some distinct features of both diseases, such as the disparate association of diabetes with atherothrombosis and AAA (discussed in more detail in a recent review) [5].

The association of obesity with AAA has been relatively less studied compared to occlusive arterial disease [6]. One of the main mechanisms by which obesity has been implicated in vascular disease is insulin resistance [7]. Several studies have suggested that diabetes mellitus, a state of relative insulin resistance, is negatively associated with AAA presence and progression [8,9]. The negative association of diabetes with AAA could suggest a protective role of obesity against AAA development and progression. Adiposity has, however, been implicated in other pathogenic mechanisms of relevance to AAA, such as the release of adipokines, suggesting the relationship between obesity and AAA may be complex [6]. This systematic review aimed to critically appraise published evidence examining: (1) the association of obesity with AAA presence; (2) the association of obesity with AAA growth.

2. Methods

2.1. Protocol and focus

This systematic review was performed with a standardised written protocol (not published) that followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines. The review was focussed on studies which assessed the association of obesity or the distribution of adiposity with: AAA presence and AAA growth.

2.2. Search criteria

A literature search was conducted of publications that was available up to 20th April, 2012. The PubMed database was searched using the following terms: “aortic aneurysm”, “abdominal” AND “obesity” OR “BMI” OR “waist-to-hip ratio (WHR)” OR “body adipose distribution” OR “waist circumference (WC)”. In addition, reference lists were searched from relevant literature reviews and studies to increase the yield of relevant publications.

2.3. Eligibility criteria

To be eligible studies were required to focus on the association of obesity with AAA. For inclusion studies had to be published before 20th April, 2012. There were no restrictions on the type of publications included and there was no limit on study size or published language. Included studies had to use a recognised measure of adiposity, namely BMI, WC, WHR or employ imaging techniques to quantify adipose distribution. Inclusion criteria required imaging by ultrasound scan (USS) or computed tomography (CT) to establish the presence, absence or progression of AAA. Studies were excluded if: AAA was not identified or excluded by abdominal imaging; and an objective measure of obesity was not performed. Measures of adipose distribution were excluded if they were not statistically assessed for their association with AAA presence, aortic diameter or AAA growth.

2.4. Data extraction

One author extracted the data from the identified studies. Any uncertainty was resolved by discussion between the authors. Data extracted from eligible literature included: study design, age, gender, smoking history, hypertension, diabetes mellitus, imaging method, AAA presence, obesity assessment measure, obesity presence, AAA growth (if reported), time-interval for follow-up (if reported), method of AAA growth assessment, type of statistical analysis, odds ratio (OR), 95% confidence interval (95% CI), *P* value and author conclusions. Univariate analysis results were only reported if a multivariate analysis had not been performed.

2.5. Data assessment

Data was transcribed into an excel document. The data reported varied in format. When possible the data format was standardised to include both numbers and percentages.

2.6. Quality assessment

A quality assessment tool was designed as a guide to assess the quality and heterogeneity of the included studies (Table 1). Five pertinent elements of each study's methodology were assessed including: total sample size, whether the assessor used multivariate analysis to account for recognised AAA risk factors, the method for assessment of obesity and the study design. The aim was to provide an overall quality assessment score. The assessment categories were discussed by the authors until agreement was met. Included studies were scored out of 10.

3. Results

3.1. Search results

165 published studies were identified, including 135 studies found from the initial PubMed search and an additional 30 studies

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