ORIGINAL ARTICLE

Abdominal aortic aneurysm screening: A pilot study in Turkey

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ABSTRACT

BACKGROUND: This study aims to evaluate the prevalence of abdominal aortic aneurysm (AAA) in Turkish men aged 60 years and older and the factors associated with AAA.

METHODS: Through sixty-two family health centers located in the Kecioren district of Ankara, 239 male volunteers of the target age were recruited for this pilot study. The volunteers were scanned using B-mode ultrasonography. An aorta of 3 cm or larger in outer to outer diameter was accepted as having AAA. The participants were screened for age, height, weight, known diseases and risk factors.

RESULTS: AAA was detected in 11 volunteers (4.6%). A history of smoking increased the risk of AAA (Odds ratio: 12.75; CI 95%, 1.2–134.3). The presence of an aneurysm with a history of myocardial infarction (MI) was statistically significant when compared to volunteers without a history of MI (p=0.007). Similarly, volunteers with a history of coronary angiography had a greater risk of an aneurysm than volunteers without (9.5% and 1.9%, respectively). Also, there was a negative correlation between diabetes, peripheral arterial disease, and aortic diameters.

CONCLUSION: Although AAA has high mortality rates when ruptured, it is a preventable disease. Therefore, it is necessary to know the prevalence of AAA in Turkey. Our findings were compatible with the literature. However, our study was performed as a pilot study, and there is a need for larger studies in our country.

Keywords: Abdominal aortic aneurysm; screening; Turkey; ultrasound.

INTRODUCTION

AAA is most commonly defined as an infrarenal aortic diameter of 3 cm and over,[1] or dilatation of the infrarenal aorta 1.5 times larger than the proximal aorta.[2,3] Various studies have reported that the prevalence of AAA is between 1.7–7.2.[4–6] In the United Kingdom, the National Health Service Abdominal Aortic Aneurysm Screening Programme (NAAASP) is currently being rolled out and is based on the Multicentre Aneurysm Screening Study (MASS), which is the largest population-based AAA screening programme. In that study, over 1.2 million men have been screened since 2009. According to the initial five-year results of NAAASP, the prevalence of AAA is 1.34%.[7]

Unfortunately, AAA has a high mortality rate when ruptured, with twenty-five percent of these patients dying before presentation to emergency services and 51% dying in the hospital before surgical procedures. For those who reach the operation room, the acute surgical procedures have a high mortality rate of 46%.[8] Since AAA is a curable disease using open repair (OR) and endovascular repair (EVAR), with low mortality rates (2–3%), screening studies have been performed in many countries, such as the United Kingdom,

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Norway, Australia, Sweden and Denmark. In almost all AAA screening studies, the target population was men because the prevalence is higher amongst this group. Screening women for abdominal aortic aneurysm (SWAAA) is controversial. Most studies reported that SWAAA is not cost-effective and has no benefits because of the low prevalence among women. However, in a recent meta-analysis, screening women for abdominal aneurysms (SWAN) collaborative group reported that in ever smoker females over the age of 70, the prevalence is greater than 1%.[9] Given this meta-analysis, SWAAA may be cost-effective and beneficial if screening criteria are adjusted (older age, smoking).

As with other studies in the literature, we also preferred to screen a male population. The aim of our pilot study was to investigate the prevalence of AAA in Turkish men over the age of 60 years, to evaluate the factors associated with AAA and to discuss the need for a national screening program.

MATERIALS AND METHODS

Two hundred and thirty-nine male volunteers aged 60 years and above were recruited for this study between July 2013 and July 2014 via 62 family health centers located in the Kecioren district of Ankara, Turkey. The only exclusion criterion was the existence of previously diagnosed AAA. The volunteers were scanned in the vascular laboratory with B-mode ultrasonography and the widest outer to outer aortic diameters were measured by one of the two authors (MAK, EU). An Aorta of 3.0 cm or larger in diameter was accepted as AAA. Additionally, the subjects were screened concerning age, height, weight, history of smoking, diabetes mellitus (DM), peripheral arterial disease (PAD), myocardial infarction (MI), coronary procedures, hypertension (HT) and chronic renal disease (CRD).

The results were statistically evaluated using SPSS for Windows 15. Defining statistics were shown as mean±standard deviation for normally distributed variables and median (min-max) for the non-normally distributed variables. For the nominal variables, the number of cases and percentage were used. Whether there were two groups, the significance of the difference between means and the medians were evaluated using the t-test and Mann-Whitney test, respectively. However, whether there were more than two groups, the significance of the difference between means and the medians were evaluated using ANOVA variance analysis test and Kruskal Wallis test, respectively. Nominal variables were evaluated using the Pearson chi-squared test or the Fisher exact test. The relationship between continuous variables was evaluated by the Pearson correlation test if the distribution was normal and by the Spearman correlation test if not. A multivariate logistic regression analysis was used to determine the independent risk factors for aneurysm. Odds ratio for the independent risk factors was stated 95% Confidence Interval.

This research was approved by the Clinical Research Ethical Committee of School of Medicine, Ankara University (date: 25.07.2011, no: 34-750) and all the volunteers gave informed consent. Additionally, permission to recruit volunteers via the family health centers was obtained from the Turkish Public Health Institution.

RESULTS

Two hundred and thirty-nine men aged between 60-86 years with a mean age of 69.11±7.02 years were recruited for this study. An AAA of 3 cm or larger in diameter was detected in 11 volunteers (4.6%). When evaluated separately, no relationship between abdominal aortic aneurysm and height, weight and body mass index was found. The logistic regression analysis showed that a history of smoking increased the risk of AAA (odds ratio 12.75; CI 95%, 1.21–134.36). The presence of an aneurysm with a history of MI (11.5%) was statistically significant when compared a history without MI (2.7%) (p=0.007). Similarly, participants with a history of coronary angiography had a greater risk of an aneurysm than those without (9.5% and 1.9%, respectively) (p=0.008). PAD was found in 20 participants (8.4%), but there was no significant relationship with an aneurysm (p=0.305). The evaluation of DM, hyperlipidemia, CRD and HT did not show a significant relationship with the presence of an aneurysm.

Among the two hundred and thirty-nine participants, the mean diameter values of the abdominal aorta according to the measurements of antero-posterior and transverse was 21.51±3.80 mm and 21.57±4.13 mm, respectively. Age, height, and the duration of smoking had a positive correlation with both antero-posterior and transverse diameters of the aorta ($p<0.05$). A negative correlation between PAD, DM and both aortic diameters was found ($p<0.05$).

DISCUSSION

AAA should be considered as an important health issue that causes high rates of morbidity and mortality when ruptured. Aneurysm rupture-related death is avoidable through early diagnosis and appropriate treatment. Age, male, gender, and smoking are all common risk factors for AAA.[10–12] Additionally, coronary artery disease,[11,13] cerebrovascular disease,[14] atherosclerotic disease,[11] hypercholesterolemia,[11,15] hypertension,[10,11,16] chronic renal failure[17] and peripheral arterial diseases[18] are among other risk factors.

Smoking is a major risk factor in almost all studies about AAA screening, which causes AAA due to its effects of promoting inflammation, proteolysis, and smooth muscle cell apoptosis.[19] The duration and amount of smoking increase the risk of AAA.[20,21] In the ADAM study, the findings showed that smoking increases the AAA risk 5.07 fold.[11] Vardulaki et al.[12] found that AAA risk was 2.5 folds higher in long term smokers. In addition, smoking may enhance aneurysm growth

and increases the risk of rupture,[22] while smoking cessation slowly decreases the risk of AAA.[20,23] It is, therefore, considered an essential component in the management of AAA. According to the World Health Organization (WHO) database, the smoking rate in male adults was 43.7% in the Turkish population in 2016.[24] In our study, we found that smoking increased AAA risk 12.7 folds. Since the smoking rates are very high and there is an increase in life expectancy of the male population, we estimated that AAA prevalence could be even higher in Turkey.

In our study, there was no correlation between height and AAA. However, AP and transverse aortic diameters were directly proportional to height. In the ADAM study, a similar correlation was found between aortic diameters and height.[11]

When BMI and weight were compared with AAA and aortic diameters separately, no relationship was found. Takagi et al.[25] reviewed the literature and found a similar result. However, Cronin et al.[26] found a positive correlation between BMI and AAA.

In previous studies, a positive correlation between CAD and AAA was shown.[11,13] In a study of a male population of 65 years of age and older, the AAA prevalence was 14.4% in the group with CAD, while it was 8.6% in the group without.[27] Long et al.[28] also found that CAD increased AAA risk by 2.44 folds. We also investigated this relationship by questioning the history of MI, coronary angiography, stent, and by-pass. We found that the AAA rate was 11.5% in the group with a history of MI, while it was 2.7% in the non-MI group ($p<0.05$). A similar correlation between a history of coronary angiography and AAA was also found ($p<0.05$). AAA was more frequent in subjects with a history of myocardial infarction and coronary angiography separately. According to these findings, coronary arterial disease patients may be a high-risk subgroup for AAA screening.

In some large-scale studies, such as Rotterdam and the ADAM, hypercholesterolemia was reported as a risk factor for AAA.[11,15] However, in our study we did not find any relationship between hypercholesterolemia and AAA. HT was also reported as a risk factor for AAA in several studies,[10,11,29] but we did not find any relationship on this measure either. In the literature, there are studies which found that PAD increased the risk of AAA.[17,18] However, in our study, there was no statistically significant relationship between AAA and PAD, although the aortic diameters of volunteers with PAD were smaller.

AAA risk is lower and aortic diameters are smaller in people with DM.[30] In our study, DM was detected in 71 people and two of these had an aneurysm (2.8%). The AAA rate was 5.4% among non-DM volunteers. Although the AAA rate was higher in the non-DM group, this was not a statistically significant finding. However, aortic diameters were smaller amongst volunteers with DM.

Aneurysms larger than 5.5 cm or which have a rapid expansion pattern (at least 0.5 cm enlargement in six months) are candidates for surgical repair. Aneurysms below this criterion can be safely followed up with an ultrasound every six months. In the ADAM study, 80% of AAAs had surgical treatment in the 5-year follow-up period.[11] In our study, all patients with AAA had measurements below 5.5 cm and these patients were invited for follow-up ultrasonography in our Vascular Surgery Department. Furthermore, some important health information was provided for these patients.

As mentioned, AAA is usually an incidental disease with high morbidity and mortality rates and results in high-cost treatments when ruptured. Life expectancy in Turkey has increased over time as in other developing countries. The Turkish Statistical Institute (Turkstat) declared the current average life expectancy at birth for Turkish people to be 78 years (80.7 for women and 75.3 for men).[31] As a result, it is estimated that ruptured AAA incidence will rise in Turkey due to the possible increase of diseases, which are risk factors for AAA. Thus, AAA screening emerges as a requirement. Bergqvist et al.[32] argued that there is a need for AAA screening programs, referring to the WHO's criteria for screening and that it is recommended for all older males. Population screening of older men for AAA reduces aneurysm-related mortality by reducing the incidence of aneurysm rupture.[33] In a recent meta-analysis conducted by Takagi et al.[34] reported that screening significantly reduces all-cause and AAA-related mortality. Additionally, the cost-effectiveness of AAA screening programs has been shown in other studies,[35–37] although this may differ across countries according to the different types of health systems.

The limitation of our study was the inadequate number of participants. We assumed that this was mainly because of the distance between their home and the hospital where they were scanned. Therefore, in future screening studies, it will be more useful for ultrasonography to be performed in the family health centers of each district to enroll as many participants as possible.

In conclusion, our findings were compatible with the literature. However, this research was performed as a pilot study and there is a need for larger studies that would provide crucial information about the prevalence of the disease and cost-effectiveness of a completely population-screening program in Turkey.

Ethics Committee Approval: Approved by the local ethics committee (date: 25.07.2011, no: 34-750).

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ORİJİNAL ÇALIŞMA - *ÖZET*

Abdominal aort anevrizması tarama programı: Türkiye'den bir pilot çalışma

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AMAÇ: Bu çalışma 60 yaş ve üzeri Türk erkekleri arasında abdominal aort anevrizması (AAA) prevalansını ve bununla ilişkili faktörleri değerlendirmeyi amaçlamaktadır.
GEREÇ VE YÖNTEM: Ankara ilinin Keçiören ilçesinde bulunan 62 aile hekimliği aracılığıyla 60 yaş ve üzeri erkek bireyler çalışmaya davet edildi ve 239 gönüllü çalışmaya alındı. Gönüllüler B-mod ultrason ile tarandı. Dıştan dışa çapı 3 cm ve üzeri tespit edilen aort anevrizmatik kabul edildi. Ayrıca katılımcılar yaş, boy, ağırlık, bilinen hastalıklar ve risk faktörleri açısından da sorgulandı.
BULGULAR: On bir katılımcıda AAA tespit edildi (%4.6). Sigara içme öyküsü olanlarda AAA riskininin arttığı tespit edildi (Odds ratio: 12.75; CI %95, 1.2–134.3). Daha önce miyokart enfarktüsü geçirmiş olanlarda anevrizma oranının, geçirmemiş olanlara göre daha yüksek olduğu tespit edildi (p=0.007). Benzer bir şekilde, koroner anjiyo yapılma öyküsü olanlarda yapılmayanlarra göre anevrizma oranının daha fazla olduğu görüldü (sırasıyla %9.5 ve %1.9). Ayrıca aort çapları ile diyabet ve periferik arter hastalığı arasında negatif korelasyon olduğu görüldü.
TARTIŞMA: Abdominal aort anevrizması rüptüre olduğu zaman ölüm oranı yüksek fakat önlenebilir bir hastalıktır. AAA'yı önlemeye hastalığın toplumda görülme oranını araştırarak başlamak gereklidir. Sonuçlarımız literatür ile uyumlu bulunmuştur. Fakat çalışmamız bir pilot çalışma olarak tasarlanmıştır ve daha geniş katılımlı çalışmalara ihtiyaç vardır.
Anahtar sözcükler: Abdominal aort anevrizması; tarama; Türkiye; ultrason.

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