The Normal Measurements of Abdominal Aortic Diameters in the Saudi Population

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أهداف الدراسة : معرفة القياسات الطبيعية للشريان الأبهر البطني لكبار السن من السعوديين والذين يتراوح أعمارهم بين الستين والثمانين عاما .

الموقع : تم اجراء فحص للبطن باستخدام الموجات الصوتية بواسطة اطباء اشعاعيين متخصصين وذلك في اطار دراسة مسحية لأكتشاف حالات أم الدماء في الشريان الأبهر البطني أجريت في منطقة : جدة بالمملكة العربية السعودية

الأشخاص الذين شملهم البحث: عينة تتكون من ٣٩٢ من المراجعين للعيادات لأسباب أخرى.

الخطة: تم أجراء ثلاث قياسات للشريان الأبهر البطني فوق مستوى الكليتين عند وسط الشريان فوق تفرع الشريان.

النتائج : وجد أن متوسط قطر الشريان ١٫٨٠سم + أو - ٠٫٢٠ في كامل المجموعة ، كما وجد أن شريان الذكور كان أكثر اتساعاً (١٫٨٢سم + أو - ٠٫٢٥) بالمقارن بالأناث (١٫٧١سم + أو - ٠٫٢٧) كما وجد أن الشريان أكثر أتساعاً في المدخنين.

الأستنتاج: بصفة عامة يعتبر قطر الشريان الأبهر الأورطي للسعوديين أصغر بالمقارنة بالمقاسات الأوربية.

Objective: To identify normal aortic diameters in elderly Saudi people aged 60–80 years.
Setting: A prospective screening programme by ultrasound for abdominal aortic aneurysm in elderly people carried out in the Jeddah area, Saudi Arabia.
Subjects: The subjects were 392 consecutive candidates attending a clinic for other reasons.
Design: Aortic diameter at suprarenal (just above origin of renal artery) mid-aorta and just above bifurcation were measured ultrasonologically by a qualified radiologist.
Results: Average mean for whole group was 1.80 ± 0.02 SD; males have wider aorta (mean $= 1.82$ cm ± 0.25 SD) compared with female (mean $= 1.71$ cm ± 0.25 SD); wider diameters were also noted in smokers (p value $= 0.05$).
Conclusion: Overall Saudi aortic diameter are smaller than European diameters. *Saudi Medical Journal* 1995; **16**(3): 261–263

Keywords: Normal aortic diameters. Abdominal aortic aneurysms.

Atherosclerotic aneurysmal disease can affect any artery in the body. However, the abdominal aorta is the commonest artery to be affected.[1] To diagnose abdominal aortic aneurysm the normal diameters for the abdominal aorta should be identified. To the best of our knowledge, this is not yet known in the Saudi population. Hopefully, this short report will provide useful information for the world medical literature on this point. In this study, the diagnostic ultrasound was used as a reliable tool to measure the aortic diameters in our population. Undoubtedly, it is the best and cheapest method described in the literature for screening abdominal aortic aneurysms (AAA) by measuring aortic diameters non-invasively.

Subjects and Methods

In the course of a prospective screening programme for AAA, 392 consecutive candidates attending a clinic in either the primary health care centre or hospital outpatient department were studied. All candidates were subjected to an abdominal ultrasound examination performed by a qualified radiologist. This was done using sonoline ultrasound machine with 3.5 and 5 mHz probes. The course of the infrarenal abdominal aorta was imaged fully to bifurcation in longitudinal and transverse planes. Three measurements were usually attempted at the following levels: just above renals (suprarenal), mid-aorta, just above bifurcation. Once a provisional diagnosis of AAA was made, a CT abdominal examination without and with intravenous

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contrast was usually conducted. The contrast examination was obtained in the dynamic mode (CT angiogram). Arteriography was carried out on peripheral vascular disease (PVD) patients or when surgical intervention to repair AAA was considered. Aneurysms less than 14 cm in diameter, or if surgical repair of the aneurysm was not feasible as decided by the vascular surgeon, were scheduled for follow-up by abdominal ultrasound every 4 months and CT examination every 6 months.

All data were entered in the computer. The D-Base IV was used for this purpose. The statistical package for the social sciences (SPSS) was used to clean the data and generate descriptive statistics such as demographic data, χ^2 tests and Fisher's exact tests were done for comparisons of proportions of AAA between the three groups. Two sample *t*-tests were used to assess the difference in the means between different groups. Sensitivity and specificity of clinical examination was calculated.

Results

Over the period of 18 months in Jeddah area 392 candidates were recruited. There were 278 (70.9%) males and 114 (29.1%) females. The mean age of the group was 66.0 years ± 6.3 SD (range 60–80 years). One-third of our subjects were over 70 years of age. Diabetes mellitus was common as a risk factor in the whole sample as 172 (43.9%) were known diabetics. However, only 101 (25.7%) were known hypertensives. There were also 71 (18.1%) with evidence of PVD. Interestingly, 259 (66.1%) were non-smokers. Active smokers and ex-smokers were 21.2% and 12.8% respectively.

In the whole sample, it was impossible to measure the aortic diameter at the suprarenal level in five cases (1.3%) as well as in 10.5% and 14.0% of diameters at mid-aorta and bifurcation respectively. However, the average mean of the obtained three measurements at the various mentioned levels (excluding the ectatic and aneurysmal aortas) was 1.80 cm ± 0.26 SD. The males had significantly (p value < 0.001) wider aortas (mean = 1.82 cm ± 0.25 SD) compared with females (mean = 1.71 cm ± 0.27 SD). Table 1 illustrates the means at various levels in males compared with females. Those measurements may be considered as the normal measurements of aortic diameters in the Saudi population. In addition (smoker and ex-smoker), smoking was significantly associated with wider aortas (p value = 0.05), (mean for non-smoker = 1.77 cm ± 0.3 SD, while the mean for smoker and ex-smoker was 1.86 cm ± 0.37 SD).

Table 1
The mean normal aortic diameters (cm ± SD) at various levels

	Whole group mean ± SD	Males mean ± SD	Females mean ± SD
Suprarenal	1.99 ± 0.36	2.00 ± 0.21	1.97 ± 0.58
Mid-aorta	1.91 ± 0.45	1.93 ± 0.45*	1.87 ± 0.44*
At bifurcation	1.52 ± 0.59	1.59 ± 0.59*	1.35 ± 0.54*
Mean	1.80 ± 0.2	1.80 ± 0.26*	1.71 ± 0.27*

* The difference using the significant χ^2 test ($p < 0.05$).

Table 2
Prevalence of ectasia and AAA in the various groups

	Ectasia (%)	AAA (%)
Whole sample	2.7	1.8
Control	1.9	0.5
Hypertensives	2.6	1.0
PVD	5.9	7.0

According to our definition of ectasia (aortic diameter of 2.0–3.2 cm), we found nine cases (2.7%) in the whole sample. These were distributed on the various groups as shown in Table 2. The difference in prevalence of ectasia between the three groups was not significant.

Discussion

In defining aortic aneurysms, one should define the normal values of aortic diameters in the population. These usually vary from one country to another depending on genetic factors—and perhaps the lack of uniformity in the diagnostic tool is an additional problem. Nevertheless, age and associated diseases were analysed in the targeted group studied. Two questions were proposed by Lucarotti *et al.*:[2] 'a dilatation in comparison with what?' and 'how much dilatation'. We have taken the aortic measurements at three levels and we believe that this report is the first of its type giving the normal values of aortic diameters in our population as demonstrated in Table 1. As in other studies[2,3] a significant difference was noticed between male and female measurements. Our aortic diameters are significantly less than those obtained in other European studies (2.0 cm in Britain,[3] 2.8 cm in Portugal[4]). In the whole sample ectasia was noticed in 2.7% with the highest occurrence in the PVD group (5.9%). These percentages again are low when compared with similar studies in the literature ranging from 8 to 10%.[3,5] Similar to Carvalho *et al.*,[4] we could not find a correlation between ectasia and hypertension, nor to age of the patient.[6]

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