

Abdominal aortic dimensions in Sri Lankan patients: a computed tomography imaging based preliminary study.

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Abstract

Introduction

The abdominal aorta begins at the aortic hiatus of the diaphragm at the 12th thoracic vertebral level and ends by dividing into common iliac arteries at the fourth lumbar vertebral level. The diameter of the aorta varies according to age, gender, and race. Generally, the diameter of the infrarenal aorta (IRD) in the western and Korean populations is 19.0 to 21.0 mm.

Methodology

In this study, 59 Computed Tomography (CT) images of patients who underwent contrast-enhanced abdominal CT for non-aorta related illness were analyzed.

Results

There were 35 males (59.3%). The mean age was 58.2 years (30-88). The mean Supra Coeliac Aortic Diameter (SCD) was 20.2 mm (16.5-27.0) and the mean Infra Renal Diameter (IRD) was 15.5 mm (11.2-19.3) in all subjects. IRD in males was 16.4 mm and IRD of males from a western study was 19.3 mm and this difference was statistically significant.

Conclusion

Therefore the Sri Lankan males have smaller aortic diameter compared to the western population. This should be taken into consideration when aortic aneurysm diameter is defined and when the threshold diameter for intervention is determined.

Introduction

The abdominal Aorta (AA) begins at the hiatus of the diaphragm at the 12th thoracic vertebral level and ends by dividing into common iliac arteries at the fourth lumbar

vertebral level. The diameter of the AA decreases from the origin to the division with a significant reduction inferior to the origin of the visceral branches (infrarenal level). The aortic diameter varies with age, gender, and race [1]. Normal diameters of the infra-renal aorta in Korean and European populations are 19.0 and 21.0 mm respectively [2, 3]. There is a general belief that the aorta and the other arteries are smaller in diameter in South Asian and Sri Lankan populations. In a study done in India, the mean diameter of the infra-renal aorta was 13.8 mm (SD - 1.9) [4]. This aortic diameter is significantly smaller when compared to the aortic diameter of the European population (19.3mm) (P -0001) [5]. In Sri Lanka, no such studies were done on abdominal aortic diameters to date. However, surgeries are frequently performed on the aorta. Knowing the abdominal aortic diameter in the Sri Lankan population will help to define the definition of aortic aneurysms and the threshold for intervention. Also it will help in the selection of suitable grafts for aortic bypass surgeries.

The current study is on the abdominal aortic diameters from the CT images of patients presenting with an illness not related to the aorta in Sri Lanka.

Methods

This is a cross-sectional descriptive study done at the Teaching Hospital Anuradhapura (THA) Sri Lanka, from November 2018 to January 2019. Images of consecutive patients undergoing contrast-enhanced Computed Tomographic scan (CT) for non-aorta related illness were included. Data on age, gender and aortic diameter were collected. All the CT scans were done with Toshiba Aquilion Prime multi detector scan. Omnipaque 300 contrast was used with an injection rate of 4 to 5 ml/sec through 17G or 18 G cannulae. Images were acquired after 25 to 30 sec delay. Aortic diameter was measured as follows, 1 cm above coeliac axis (Supra-Coeliac Diameter- SCD) and just inferior to the renal arteries (IRD). Axial images, coronal images and sagittal images were analysed (). On axial imaging the maximum diameter was taken as the final diameter. However in case of tortuous aorta the diameter was measured perpendicular to the axis of the tortuous aorta to avoid getting falsely high value. The patients with incomplete data and

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unclear images were excluded. A “p” value of less than 0.05 was considered statistically significant.

Results

Fifty nine patients were included. There were 35 (59.3%) males and 24 females (40.7%). Mean age was 58.2 years (30-88). Mean SCD in all subjects was 20.2 mm (16.5-27.0). The mean SCD in males was 21.1 mm and it was 18.9 mm in females. This difference was statistically significant ($p = 0.0002$). The mean IRD in all subjects was 15.5 mm (11.2-19.3). The mean IRD in males was 16.4 mm and it was 14.1 mm in females and this difference was statistically significant as well ($P < .00001$). Supra Coeliac diameter of 30 -54 year age group was 19.1 mm and that of 55 - 80 year age group was 20.8 mm and this difference was statistically significant ($p = 0.0038$). Similarly there was an increase in the size of the infra renal aorta (IRD) in the above age groups i.e. in 30 - 54 year group it was 14.9 mm, whereas in 55 to 80 year age group it was 15.8 mm. But this difference was not statistically significant ($p = 0.078$).

Discussion and Conclusions

This study shows that the IRD of Sri Lankan males is significantly smaller than the western population. The mean diameter of the IRD in males in this study was 16.4 mm. This was compared with the IRD values from other studies. In Framingham Heart Study, there were 1767 males. The mean

diameter of the infra renal aorta was 19.3 mm [5]. This difference is statistically significant ($p = 0.00001$) when compared with the mean IRD of the males in Sri Lankan study. Also in another study done in Korea among 478 males, the mean IRD was 19.0 mm [2] and this difference was also statistically significant ($p = 0.00001$). These facts indicate that the IR diameter of the study population in Sri Lanka is significantly smaller than the western and the Korean population. This study confirms the common belief that the diameter of the abdominal aorta of the Sri Lankan population is smaller than the western population. This marked difference suggests that the aortic aneurysm size definition and the size threshold for aortic aneurysm repair have to be redefined in Sri Lankan population.

Limitations

The number of subjects included in this study is small compared to other similar studies mentioned above. This is a drawback in this study. Also as mentioned earlier the diameter of the aorta is also known to vary with patients' comorbid conditions (hypertension), height, BMI, etc. [6]. The current study was retrospective study from the records at the radiology department. Therefore the above details cannot be analysed. This is also a drawback in this study. Therefore similar studies are needed in the future with a larger sample size.

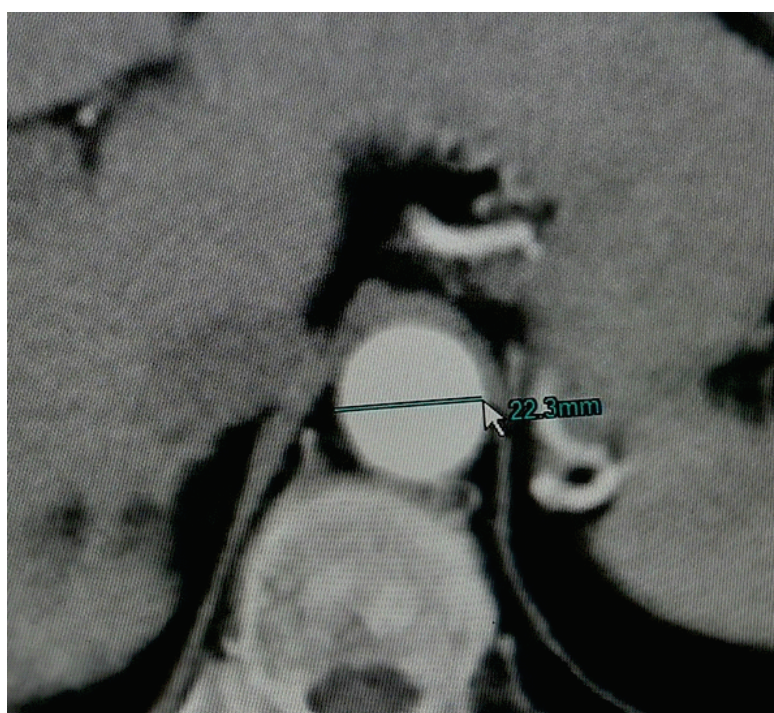


Figure 1. Supra celiac aortic diameter measurement

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