



A CADAVERIC STUDY ON MORPHOMETRY OF THE ABDOMINAL AORTA IN SOUTH INDIAN POPULATION

Dr Sherin Chacko*

Senior Resident, Department of Anatomy, Government Medical College Kozhikode*Corresponding Author

Dr Namitha Viswanath

Associate Professor, Department of Anatomy, Government Medical College Thrissur

Dr Sama Abdulkadar

Assistant Professor, Department of Anatomy, Government Medical College Kozhikode

ABSTRACT

Abdominal Aorta (AA) is one of the largest artery supplying the abdominal viscera and surrounding structures. With the advent of interventional surgeries the morphometry of AA is to be estimated to avert any difficulties during such procedures. Studies on morphometric dimensions of AA on the South Indian population are very few. Knowing these parameters is important for interventional radiologists and surgeons during diagnosis and surgery. Morphometry of AA was studied in 50 human cadavers by dissection method to estimate the quantitative morphology of AA in the South Indian population. Various parameters like length, diameter, and distance between the ventral branches of AA were measured and compared with available literature. The length of AA was 12.54 ± 0.95 cm and the diameter was 11.73 ± 2.20 mm in our study. The distance between Coeliac Trunk and Superior Mesenteric Artery was found to be 1.23 ± 0.35 cm and Superior Mesenteric Artery and Inferior Mesenteric Artery was 6.96 ± 0.66 cm. Morphometric assessment of AA is essential for navigating through endovascular repairs of abdominal aortic aneurysms. This study was carried out to find the quantitative morphology of AA in the South Indian population.

KEYWORDS : Abdominal Aorta, Morphometry, Endovascular repair, Aneurysms

INTRODUCTION

Abdominal Aorta (AA) is the major artery of abdomen supplying gastrointestinal tract. With advancing age, there is a progressive increase in diameter of both sexes and tapering of AA becomes more evident. Morphometric assessment of AA benefits endovascular interventions. In view of recent advances in minimally invasive endovascular procedures amidst escalating numbers of gastrointestinal diseases warranting intra-abdominal surgeries, need for estimating morphometric parameters of AA is essential. This study is to help determine morphometry of AA South Indian population to support future developments and perform procedures with vigilance to ameliorate any aftermath and prevent catastrophe in order to save lives.

SUBJECTS AND METHODS

The materials examined to study the morphometric details of the Abdominal Aorta (AA) were carried out on 50 formalin-fixed embalmed cadavers in the Department of Anatomy during the period from 2020 to 2022. All cadavers which were available for dissection were used for the study after obtaining institutional research and ethical committee clearances. Cadavers with any traumatic lesions or surgical procedures of the abdomen were excluded from the study. An observational study was conducted by dissection method which was carried out according to Cunningham's manual of dissection. The length of AA was measured using a non-stretchable cable wire from the aortic hiatus to the bifurcation of the aorta. The external diameter of the AA was measured from the outer wall to the outer wall at the level above the aortic bifurcation. Also inter arterial distances between the three unpaired ventral branches were taken using digital vernier callipers. All findings were documented and photographed

RESULTS

50 Abdominal Aorta (AA) were studied. The length of the AA was measured using a non-stretchable cable and a measuring ruler from the aortic hiatus in the diaphragm to the bifurcation of AA into the right and left common iliac arteries. The maximum length of AA was found to be 16.0 cm while the minimum length was 10.60 cm with a mean of 12.54 cm and a standard deviation of 0.95 cm.

The diameter of AA was measured just above the bifurcation of AA into right and left common iliac arteries using a digital vernier calliper (Fig. 1) and the following observations were noted. The maximum diameter of AA was 18.06 mm while the minimum diameter was 4.29 mm with a mean of 11.73 ± 2.20 mm.

FIG. 1 - Measuring diameter of AA using digital vernier calipers at the bifurcation of AA



Coeliac Trunk (CT), Superior Mesenteric Artery (SMA) and Inferior Mesenteric Artery (IMA) are the three ventral branches given off from the AA. Distance between these adjacent anterior branches of AA was measured with a non-stretchable cable and measuring scale and the findings were noted. Distance between CT and SMA (Fig. 2) ranges from 1.80 cm to 0.30 cm with a mean distance of 1.23 cm and a standard deviation of 0.35 cm. Distance between SMA and IMA ranges from 8.80 cm to 5.40 cm with a mean distance of 6.96 cm and a standard deviation of 0.66 cm.



FIG. 2 - Measuring distance between Coeliac trunk (CT) and Superior Mesenteric Artery (SMA)
1CT – SMA

DISCUSSION

Morphometric dimensions of the Abdominal Aorta (AA) show substantial variation. These changes are attributed to the growth and differentiation during the period of embryological development.^[1] In the present study length of AA ranges from 10.6 to 16.0 cm with a mean of 12.54 ± 0.95 cm. The length of AA reported by various authors is compared in Table No: 1. Feller and Woodburne found that the length of AA ranged from 10.9 cm to 15.2 cm with a mean of 13.0 cm.^[3] This finding was comparable with the current study's finding of 12.54 ± 0.95 cm. Previous studies all have a mean of around 13.0 cm and match with the present study.^[2,4]

Table: 1 Comparison of Length of the Abdominal Aorta

Authors	Sample size	Range (cm)	Mean (cm)
Ruggles George ^[2]	120	9.5-16.6	13.2 ±1.39
Feller and Woodburne ^[3]	104	10.9-15.2	13.0
Mane Uddhav Wamanrao et al ^[4]	40	11-17	13.2 ±1.43
Present study	50	10.6-16.0	12.54±0.95

The diameter of AA was found to have a mean of 11.73 mm and a standard deviation of 2.20 mm in the current study. Various authors have determined the diameter of AA which is depicted in Table No:2. Ezenwugo et al studied 400 samples and reported that the mean diameter of AA was 12.9 (2.3) mm.^[11] The above study is found to be more consistent with the present study where the mean diameter was 11.73 (2.20) mm. Previous studies observed diameters of AA as a value above 15 mm.^[4,5,6,7,8,9,10]

Table: 2 Comparison of Diameter of the Abdominal Aorta

Authors	Sample size	Diameter (SD) mm
K. Singh et al ^[5]	6892	17.6 (2.5)
N.Sariosmanoglu ^[6]	596	15.7 (3.6)
Allison et al ^[7]	504	18.6 (2.2)
Jin Hyun Joh et al ^[8]	1218	18.3
Vijayapraveena Paruchuri et al ^[9]	3573	32 (4.0)
Acharya Arjun et al ^[10]	100	15.42 (1.90)
Mane Uddhav Wamanrao et al ^[4]	40	16.5
Ezenwugo et al ^[11]	400	12.9 (2.3)
Present Study	50	11.73 (2.20)

The distance between the adjacent anterior branches of AA was observed in this study. The distance between CT and SMA and also the distance between SMA and IMA were measured. A comparison of the distance between CT and SMA of the present study with various authors is given in Table No: 3.^[12,13] The present study observed a mean of 1.23 cm with a standard deviation of 0.35 cm which is comparable with the findings of Mane Uddhav Wamanrao et al whose findings were 1.29 cm.^[4]

Table: 3 Comparison of Inter arterial distance between the ventral branches of the Abdominal Aorta

Authors	Sample size	Distance between CT and SMA [Mean (SD) cm]	Distance between SMA and IMA [Mean (SD) cm]
Ruggles George ^[2]	94	1.6 (0.50)	7.1 (1.21)
Songur et al ^[12]	95	1.43 (0.26)	5.77 (0.80)
Mane Uddhav Wamanrao et al ^[4]	40	1.29	6.95
Priya and Kumari ^[13]	50	0.67	4.9
Present Study	50	1.23 (0.35)	6.96 (0.66)

Table No: 3 also shows the comparison of the findings of the distance between SMA and IMA in the present study with that of other authors.^[12,13] From the table, it is evident that the present study shows a mean of 6.96 cm and a standard deviation of 0.66 cm which is consistent with the study done by Mane Uddhav Wamanrao et al who reported that the distance between SMA and IMA was 6.95 cm.^[4]

CONCLUSIONS

Knowledge of the morphometry of AA needs to be assessed prior to any endovascular procedures to prevent complications during the procedure. It is always better to perform pre-operative arterial screening imaging by using three-dimensional computed tomographic angiographies to reduce the morbidity and mortality of the patient and for the ease of the surgeon to navigate these areas during the procedure.

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