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The Compressed Diameter of the Azygos Vein at the Level of Formation and Termination

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ABSTRACT

The azygos vein drain the right posterior intercostal veins except the first, the veins from the second to fourth intercostal spaces usually via a right superior intercostal vein, the hemiazygos and accessory hemiazygos veins. Oesophageal, mediastinal and pericardial veins and near its end, right bronchial veins. The Morphology of the Azygos vein was studied in 50 embalmed human cadavers irrespective of their sex. The specimens were obtained from the Department of Anatomy of medical colleges situated in and around Bangalore. Following the guidelines of Cunningham's manual of practical anatomy, volume two, thorax and abdomen, Volume two, Thorax and Abdomen fifteen edition. Anterior thoracic wall was dissected; the lungs and heart were removed. Out of 50 specimens, in 23 specimens (46%), compressed diameter of the azygos vein at the level of formation was 3mm. The minimum compressed diameter was 2mm; maximum was 6mm and the mean diameter of the azygos vein at level of formation was 3.64 with SD of ± 1.66 . 18 specimens (36%) had compressed diameter ranging between 6-7 mm and in 17 specimens (34%) at the level of termination of the azygos vein. The minimum was 4.0 mm, maximum was 15.0 mm and mean diameter was 7.92 with a SD of ± 2.09 .

INTRODUCTION

The anatomic variations of the azygos vein and its main tributaries are due to developmental changes in the subcardinal vein on the right and the left side. Variations of these veins are important from a surgical perspective. Knowledge of these variations is indispensable in the operative and diagnostic procedures within the posterior mediastinum^[1-2].

The azygos vein drains the right posterior intercostal veins except the first, the veins from the second to fourth intercostal spaces usually via a right superior intercostal vein, the hemiazygos and accessory hemiazygos veins, oesophageal, mediastinal and pericardial veins and near its end, right bronchial veins. When it begins as lumbar azygos, the common trunk formed by the right ascending lumbar and subcostal veins is its largest tributary^[3-4].

MATERIALS AND METHODS

The morphology of the Azygos vein was studied in 50 embalmed human cadavers irrespective of their sex. The specimens were obtained from the Department of Anatomy of medical colleges situated in and around Bangalore.

Following the guidelines of Cunningham's manual of practical anatomy, volume two, thorax and abdomen, Volume two, Thorax and Abdomen fifteen edition. Anterior thoracic wall was dissected, the lungs and heart were removed.

In the cavity of the thorax, the posterior intercostal veins were exposed. The Right posterior intercostal veins were followed to trace the azygos vein. The Hemiazygos vein and accessory hemiazygos vein were traced by following the course of left posterior intercostal veins.

Then the formation and level of the formation of the azygos vein was noted. The compressed diameter of the trunk of the azygos vein was measured close to its formation and termination by sliding callipers. The level of the azygos arch was observed and noted. The course of the azygos vein was observed with reference to midline of the vertebral column and the level of inferior and superior crossing of the azygos vein with reference to the thoracic vertebral level was noted. The level of termination of the hemiazygos vein and accessory hemiazygos vein were noted for each specimen. After observation, the moisture over the vein and nearby areas was removed with filter paper. All the specimens were duly numbered and photographed.

The mean, standard deviation and chi's square test was calculated for the compressed diameter at the formation and termination of the azygos vein. The data obtained was recorded, analyzed and compared with that of previous studies.

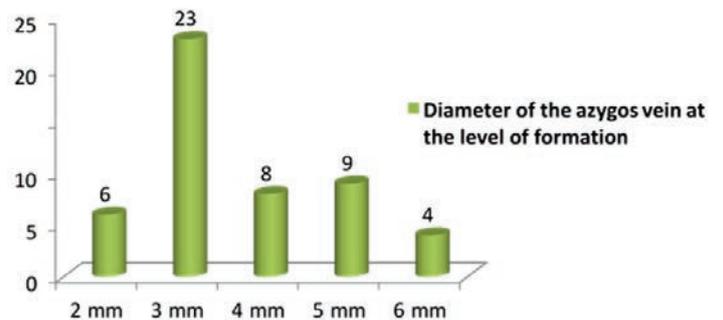
RESULTS AND DISCUSSIONS

The compressed diameter of the azygos vein at the level of formation had been measured in 50 specimens using slide callipers and tabulate below.

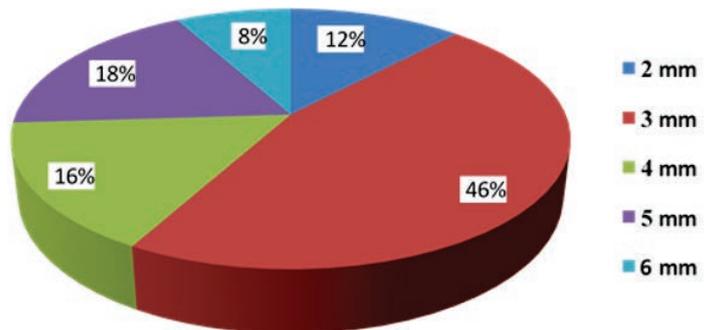
Table 1: Showing the compressed diameter of the azygos vein at the level of formation

Diameter (mm)	Number	Percentage (%)
2	06	12
3	23	46
4	08	16
5	09	18
6	04	08
Total	50	100
Mean ±SD	3.64±1.66	

Out of 50 specimens, in 23 specimens (46%), compressed diameter of the azygos vein at the level of formation was 3mm. The minimum compressed diameter was 2mm, maximum was 6mm and the mean diameter of the azygos vein at level of formation was 3.64 with SD of ±1.66.



Graph. 1: Bar diagram showing the compressed diameter of the azygos vein at the level of formation



Graph. 2: Pie diagram showing the compressed diameter of the azygos vein at the level of formation

Table 2: Showing the compressed diameter of the azygos vein at the level of termination

Diameter (mm)	Number	Percentage (%)
4 -5	04	08
6 - 7	18	36
8 - 9	17	34
10 -11	08	16
12 & above	03	06
Total	50	100
Mean ±SD	7.92±2.09	

The compressed diameter of the azygos vein at the level of termination had been measured using slide calliper and tabulated below.

18 specimens (36%) had compressed diameter ranging between 6-7 mm and in 17 specimens (34%) at the level of termination of the azygos vein. The minimum was 4.0 mm, maximum was 15.0 mm and mean diameter was 7.92 with a SD of ±2.09.

Graph 3: Bar diagram showing the compressed diameter of the azygos vein at the level of formation

Graph .4: Pie diagram showing the compressed diameter of the azygos vein at the level of termination

Table 3: Showing the comparison of the compressed diameter at the level of formation of the azygos vein found in earlier studies with that of the present study

Author	Mean diameter (mm)	Minimum diameter (mm)	Maximum diameter (mm)	SD
Kutoglu T <i>et al.</i> (2012) ^[5]	4.05	2.0	7.5	1.03
Present study (2013)	3.64	2.0	6.0	1.16

The study conducted by Kutoglu^[5] showed that the minimum diameter is 2.0 mm, maximum diameter is 7.5 mm and range is 5.5 mm and the mean diameter of the azygos vein at its origin was 4.05 with SD of ±1.03 mm. In the present study, the compressed diameter of the azygos vein at the level of formation was ranging from 2 mm-6 mm. In maximum number of specimens, 23 (46%), the diameter was 3 mm. The mean diameter of the azygos vein at the level of formation was 3.64 with SD of ±1.66.

The difference in the mean diameter of the present study and Kutoglu^[5] may be due to racial difference. In the present study, out of 23 specimens having the diameter of 3mm, in 20 specimens, the azygos was formed by a single root. In remaining 3 specimens, the azygos vein is formed by double root. The maximum diameter of 6mm was measured in 4 specimens (8%), where as in 2 specimens, the azygos vein was formed by the three roots and in the remaining two by single root. So the diameter depends upon the number of roots forming it^[6].

The compressed diameter of the azygos vein was measured at its termination into superior vena cava using slide callipers. In present study, the maximum number of the azygos vein, 18 specimens (36%) had the compressed diameter of ranging between 6- 7mm and the diameter of 8-9 mm in 17 specimens (34%). The mean diameter of the azygos vein at the level of termination were compared with the previous studies and represented in the following table.

Table 4: Showing the comparison of the compressed diameter at the level of termination of the azygos vein found in earlier studies with that of present study

Author	Mean diameter (mm)	Minimum diameter (mm)	Maximum diameter (mm)	SD
Kutoglu T <i>et al.</i> (2012) ^[5]	8.56	5.0	12.2	1.26
Present study (2013)	7.92	4.0	15.0	2.09

Kutoglu T *et al.* studied the diameter at the level of formation of azygos vein in 48 cadavers. In that study, the minimum diameter is 5.0 mm, maximum diameter is 12.2 mm and the mean diameter of the azygos vein at its termination was 8.56 mm with SD±1.26 mm. In present study, the minimum diameter is 4 mm, maximum is 15 mm. The mean diameter of the azygos vein at level of termination was 7.92mm with SD ±2.09. The mean diameter at termination was roughly two times of the mean diameter at formation in of Kutoglu T *et al.* study as well as in the present study. This is because of venous blood the azygos vein received from the tributaries.

In the present study, in one specimen it was observed that the diameter at termination (4mm) was less than the diameter at formation (5mm) where no definitive Hazv and AHazv and no superior vena cava, inferior vena cava anomalies were associated. The decrease in the diameter could be due to reversal of venous flow.

CONCLUSION

The compressed diameter of the level of formation was ranging from 3-6mm. The compressed diameter was 6mm when the vein was formed by all 3 roots. The diameter approximately increased twice near the termination confirmed, that along the course the vein receives the venous blood through tributaries. In one specimen, the diameter at the level of termination was less than the diameter at the level of formation.

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