

Morphological Variation in Azygos Vein

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Abstract: ***Introduction:** The variant azygos venous system might be confused with thoracic aorta aneurysms, lymphadenopathy and tumours of posterior mediastinum. The anatomical knowledge of the variability of the azygos venous system is important for the surgical interventions of the posterior mediastinum and also during radiological investigations/diagnosis especially CT and MRI. **Methods:** The present study was undertaken on 22 embalmed adult human cadavers irrespective of age, sex used for undergraduate dissection from the Department of Anatomy, Osmania Medical College over a period of 2 years. In this present study, azygos system of veins was observed in 22 dissected human cadavers. Out of which 6 cadavers showed the variation. **Results:** In the present study, a total of normal azygos venous system was found in 16 specimens accounting for 73%. Variations were found in 6 specimens (27%); all specimens presented with shifting of azygos vein towards left of vertebral column with presence of normal positioning of accessory hemiazygos vein and hemiazygos vein, 2 transverse channels across vertebral column. **Conclusion:** Accurate knowledge about this kind of variation is very important to identify, especially in the computed tomography and magnetic resonance imaging of mediastinum. The abnormal azygos venous system may easily be confused with aneurysm, lymphadenopathy and other abnormalities like tumour. It is important to keep these kinds of variations in mind while performing the mediastinal operations or surgery of large vessels.*

Keywords: Azygos vein (AV), Hemiazygos vein(HV), Accessory azygos vein(AHZ), Superior venacava(SVC)

1. Introduction

During intra uterine development of embryo, Venous system are derived from three major veins such as Cardinal veins – from the body wall, Umbilical veins – from the placenta, Vitelline veins – from the yolk sac

The Greek root zyg refers to a pair. ‘A-’ means not. Thus, azygos means unpaired. The Azygos system is formed by veins which drain the thoracic cage and some contents of the posterior mediastinum into the superior vena cava (SVC).¹ It lies anterior to the bodies of the thoracic vertebrae and consists of three interconnected major veins the azygos (AV), hemiazygos (HV) and accessory hemiazygos (AHV) veins. The AV is embryologically derived from the right azygos line, originating caudally from the union of the right subcostal and right ascending lumbar veins.² It ascends cranially draining the lower eight right posterior intercostal veins (RPIVs) into the superior vena cava at the level of T3. Along its course it receives the HV, AHV, mediastinal, pericardial, oesophageal, right bronchial and right superior intercostal veins. The hemiazygos system (HV and AHV), together with the left superior intercostal vein, drains the lower eight left posterior intercostal and upper four left posterior intercostal veins (LPIVs) into the azygos and left brachiocephalic veins, respectively. The azygos venous system also connects the inferior vena cava (IVC) to the SVC. Thus, it has the ability to drain the lower half of the body into the SVC when the IVC is obstructed.³

The azygos vein is inconstant in the mode of origin.⁴ The Anatomical organisation of the azygos system is highly variable in terms of its origins, tributaries and levels of termination.⁵ Azygos veins are important cavo-caval and porto-caval junctions, thus forming collateral circulation in caval vein occlusion and in portal hypertension.⁶

Variations of azygos system of veins are usually associated with other congenital anomalies, especially cardiac

anomalies. According to recent data, the incidence of this variation is 0.6 – 2.0% in individuals with congenital cardiac malformations and less than 0.3% in individuals without any variations or anomalies⁷

The present study showed a rare variation in a human cadaver. Hence the aim of the present study is to document these special variation of the azygos venous system and try to deduce an embryological explanation for them.

2. Materials and Methods

The present study was undertaken on 22 embalmed adult human cadavers irrespective of age, sex used for undergraduate dissection from the Department of Anatomy, Osmania Medical College spanning over a period of 2 years. The pericardium, heart, lungs, thoracic aorta and oesophagus were removed after the removal of the anterior thoracic wall. The azygos, hemiazygos, accessory hemiazygos veins were exposed by blunt dissection. In this present study, course and termination pattern of azygos system of veins was observed. Out of which 6 cadavers showed the variation. The azygos venous system was dissected and photographs were taken.

3. Results

The following variation was encountered during routine dissection of the posterior thoracic wall in 22 human cadavers. In the present study, a total of normal azygos venous system was found in 16 specimens accounting for (73%). Variations were found in 6 specimens (27%); all specimens presented with shifting of azygos vein towards left of vertebral column with presence of normal positioning of accessory hemiazygos vein and hemiazygos vein, 2 transverse channels across vertebral column.

4. Discussion

The azygos vein is the vein that drains the thoracic wall and upper lumbar region. Azygos venous system is classified as Anson's system of classification with a basis of vertical and horizontal connection of the system. These include primitive or embryological type, transient type, unicolon type as 3 basic types with their eleven subgroups. According to this: ▪ Type I: This primitive and embryological form consists of two separate veins lying in parallel to each other in the posterior mediastinum, being anterior and lateral to the vertebral column. It is seen 1%. These parallel veins constitute the azygos vein at the right side and superior and inferior azygos veins, which are the continuation of each other's, at the left side. The veins at the left side, those that the left lumbar vein opens, subsequently open into the left brachiocephalic vein. There is only one subtype (Group 1) of this type. ▪ Type II: 98% of all cases are in this form and it is known as the transition type. It consists of Groups 2-10. There are multiple retro-aortic anastomoses between the azygos and hemiazygos venous systems. From Group 2 to Group 5 the quantity of these transverse anastomoses increases. There is continuity in the left side. Between Groups 6 and 10, it is seen a vertical bending and the number of the transverse anastomoses decreases gradually. ▪ Type III: It consists of a single azygos vein lying at the midline, on the anterior surface of the vertebral column. There is only one subtype (Group 11) of this main type. It is seen in 1% of all cases.⁸ Many variations have been reported in the formation and distribution of the azygos venous system.⁹

In our case study, a rare case of shifting of azygos vein towards left paravertebral position with presence of normal positioning of accessory hemiazygos vein and hemiazygos vein, 2 transverse channels across vertebral column.

5. Conclusion

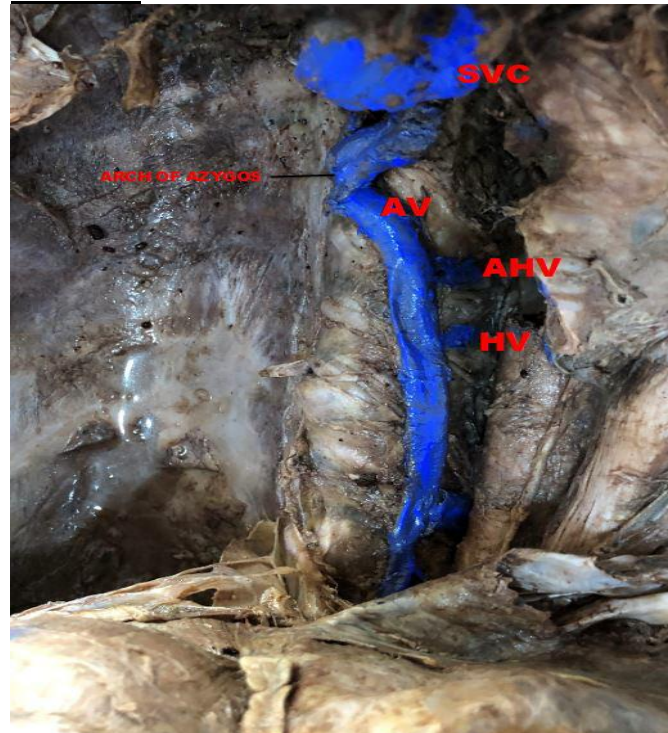
The rate of variations observed in the azygos vein was 26%.¹⁰ Such variations are found only during radiological examination or surgical procedures of posterior mediastinum. This variation can cause venous insufficiency of lower limbs with a potential thromboembolic disease. These venous anomalies may be mistaken for mediastinal mass or lymphadenopathy. It is important for clinicians to know the types of variation and normal diameter of the constituent vessels before addressing abnormal conditions, as any abnormality of the system can be misdiagnosed as an aneurysm, mediastinal tumour or enlarged lymph node. The results of this study can be useful in mediastinal surgery, mediastinoscopy and the surgery of the deformations of the vertebral column, neurovascular surgery of the retroperitoneal organs, disc herniations and fractures of the thoracic vertebrae. Cardiothoracic surgeons should be aware of such variations to prevent intrathoracicaemorrhage during operative procedures of posterior mediastinum. The azygos system also acts as a metastatic pathway to the lungs.¹¹ Therefore it is helpful to recognize the presence of these variations in order to properly interpret CT and MRI scans.

Normal position of azygos vein being Right paravertebral position. In the Present study, Azygos vein is the left

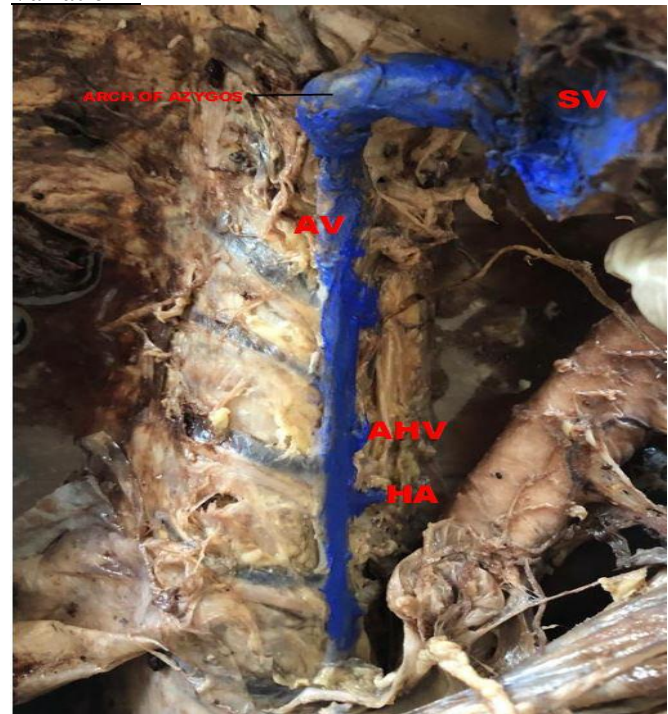
paravertebral position crossing from left to right on the bodies of thoracic vertebrae and ultimately draining in into SVC.

Presence of left sided Azygos vein (AV) with normal Hemiazygos vein (HV), Accessory azygos vein (AHV) position.

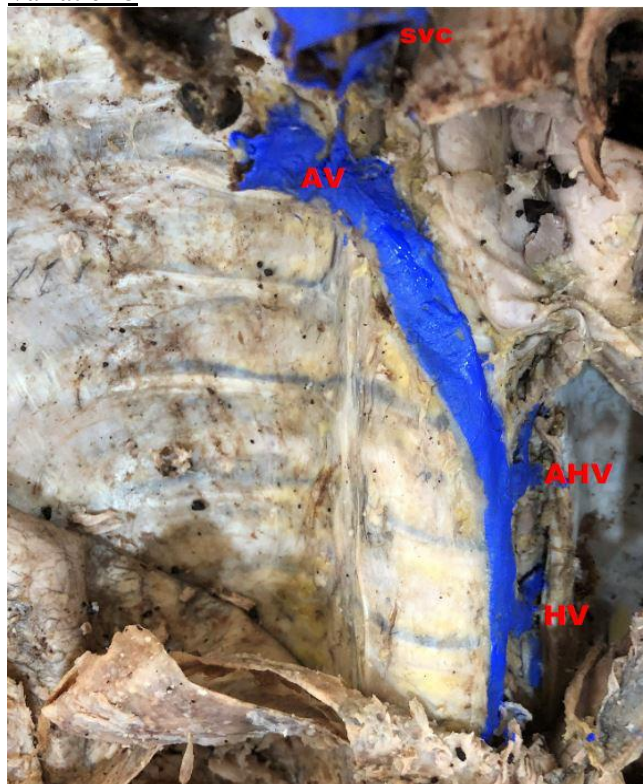
Variation 1



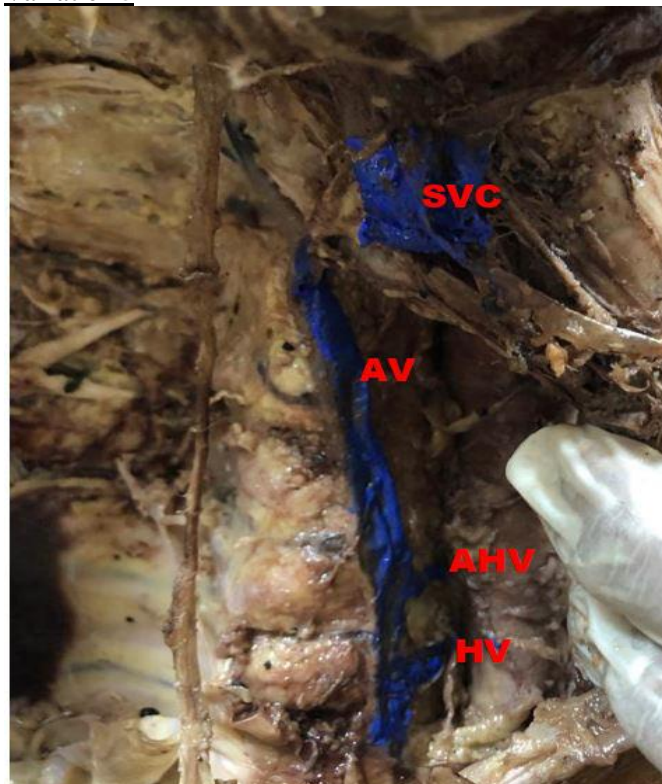
Variation 2



Variation 3



Variation 5



Variation 4



Variation 6



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