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Original Research Article

A STUDY OF THE AZYGOS VENOUS SYSTEM AND ITS VARIATIONS

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Abstract

Introduction: The cause for venous compromise is multifactorial. Variations of the venous system are generally explained on the basis of their embryological development. The description of variations of azygos venous system in literature is of significance due to the presence of other important posterior mediastinal structures. Multiple variations of the azygos veins and hemiazygos veins regarding their formation, position and mode of termination are explained on the basis of their embryological development. Venous abnormalities often complicate mediastinal surgery with intraoperative hemorrhage. Prior knowledge of the possible anatomical variations help surgeons to reduce the risk of occurrence of such events.

Material and methods:: The cause for venous compromise is multifactorial. Variations of the venous system are generally explained on the basis of their embryological development. The description of variations of azygos venous system in literature is of significance due to the presence of other important posterior mediastinal structures. Multiple variations of the azygos veins and hemiazygos veins regarding their formation, position and mode of termination are explained on the basis of their of their embryological development. Venous abnormalities often complicate mediastinal surgery with intraoperative hemorrhage. Prior knowledge of the possible anatomical variations help surgeons to reduce the risk of occurrence of such events.

Results : The position of Azygos vein on the right side was seen in 53.33% & in the midline in 46.66% of the subjects. In the present study the level of termination of the Azygos vein was between third and fourth thoracic vertebrae. Hemiazygos , the left lower complement of the Azygos vein was formed by the union of the left ascending lumbar and subcostal veins.

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Conclusion: Knowledge of the variability of the azygos venous system is an important anatomical sign post in guiding radiological diagnosis and in the surgical treatment of thoracic aortic aneurysms and tumours of the posterior mediastinum.

Key words: Azygos vein (AZV), Hemiazygos vein (HAZV), Accessory hemiazygos vein (AHAZV), Inferior vena cava (IVC).

Introduction

The Azygos venous system develops on the basis of multiple transformations of the supracardinal veins [1], right and left azygos venous lines, cranial right posterior cardinal veins which causes great variability in its anatomy, especially on the left side . Azygos veins are important cavo- caval and porto caval junctions, thus forming collateral circulation in caval vein occlusion and in portal hypertension[2]. The Azygos venous system transporting deoxygenated blood from the posterior wall of the thorax and abdomen into the superior vena cava is expected to arise from the posterior aspect of inferior vena cava at or below the level of the renal veins, though this feature is not constant. It has no symmetrically equivalent vein on the left side of the body. This system varies much in the mode of origin, course , tributaries, anastomosis and termination. Azygos vein is formed by the union of ascending lumbar veins with the right subcostal veins at the level of the 12^{th} thoracic vertebra. It ascends in the posterior mediastinum and arches over the right main bronchus at the root of the right lung to join the superior vena cava. Its tributaries, apart from the main tributary the hemiazygos veins are the bronchial veins, pericardial veins and right posterior intercostal veins.

Azygos system of veins include the azygos vein along with its left sided counterparts the hemiazygos and accessory hemiazygos veins. Together they form an anastomosis between the superior and inferior vena cavae. The large continuous channel draining the right half of the thoracic and abdominal parietes form the azygous vein. The left complement of this venous channel which drain the upper abdominal parietes and lower thoracic wall are the hemiazygos and accessory or superior hemiazygos veins , both of which drain into the azygos vein.

Material and methods:

The study was conducted in the department of anatomy of various medical colleges of Telangana state. 50 cadavers used for the study were allotted to medical undergraduates in these colleges. The cadavers which were properly embalmed were used. The thoracic region was dissected by the students exposing the azygos venous system. The whole course of the azygos vein from the level of the subcostal vein to the point of its termination into the superior vena cava was traced. All of the right posterior intercostal veins were traced to the site of their termination into the azygos vein. Communications of the hemi azygos, accessory hemiazygos veins into the azygos vein were exposed and identified by reflecting the oesophagus and aorta upwards. Right and left superior intercostal veins were also traced to their termination into the right and left brachiocephalic veins. The hemiazygos and accessory

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hemiazygos veins were traced on the left side of the bodies of the thoracic vertebrae behind the descending thoracic aorta. Terminations of the right and left ascending lumbar veins when present were traced and studied in relation to the aortic opening and the crura of the diaphragm.

Results:

In the present study 50 cadavers were observed for the mode of formation of the azygos vein. Different aspects of the azygos venous system were reported. Ozbek et al reported a case in which the hemiazygos vein was absent[3]. A right subcostal vein joining the ascending lumbar vein was found in 70% of the cases. In 30% of cases it was formed from the back of the inferior vena cava. The position of azygos vein on the right side was reported in 53.33% and in the midline in 46.66% of the subjects. In the present study the level of termination of azygos vein was between the third and fourth thoracic vertebrae. Hemiazygos vein , the left lower complement of the azygos vein is usually formed by the union of the left ascending lumbar and subcostal veins. In the present study in one case it was arising from the back of the inferior vena cava and then ascending up received the left ascending lumbar and subcostal veins before it joined the Azygos vein. The Hemiazygos vein was crossing the midline at T8 towards the right side in 60% of cases, at T 7 in 26.66%, at T 9 in 10%, and at T10 in 3.33% of the cases.

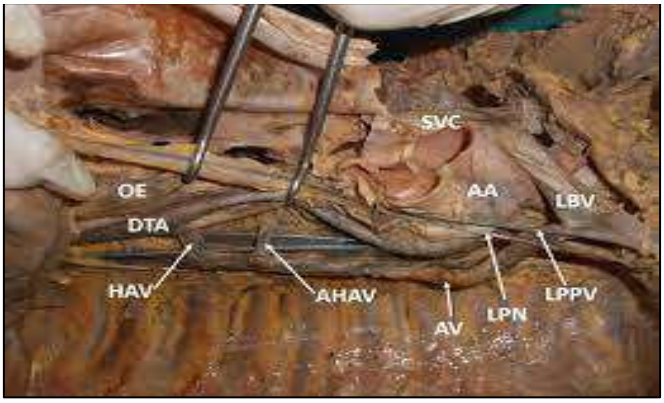

Fig1:Varaiation in termination of azygos and hemi azygos vein

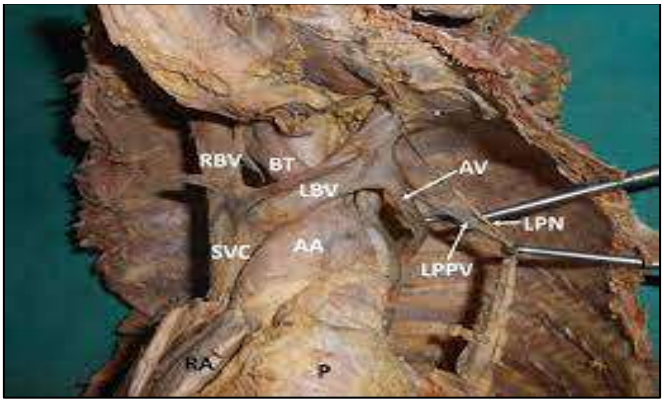

Fig2:Transposition of azygos vein

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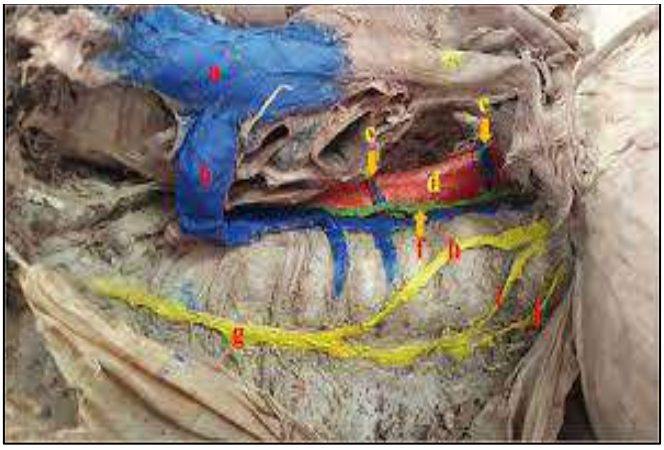

Fig3:Abnormal variation of interazygos vein

Discussion:

The present work on the variations of the Azygos system of veins was carried out in 50 cadavers. Each part of this system of veins namely the Azygos, Hemiazygos, Accessory Hemiazygos veins were studied and their formation, course, relations, terminations, tributaries, communications were explored. The azygos system of veins showed more number of variations in the mode of origin, course, termination and tributaries. Abnormalities related to the azygos system are not rare [4] . These abnormalities are generally explained by the embryological development. Azygos venous system is embryologically derived form the supracardinal veins. The right supra cardinal vein forms the azygos vein and the left supra cardinal vein forms the Hemiazygos vein. The left superior intercostal vein and accessory hemiazygos vein are derived from the left posterior cardinal vein and the cranial part of the right posterior cardinal vein forms the upper part of the azygos vein. The part that connects the Hemiazygos vein to the Azygos vein is formed by the anastomosis between the left and right posterior cardinal vein[5]

The caudal part of the right supracardinal vein forms the post renal part of the inferior vena cava, while the caudal part of the left supracardinal vein and intermediate parts of both supracardinal veins disappear.

Conclusion:

The variant azygos system may easily be confused with aneurysm, lymphadenopathy or tumour [6,7] . Knowledge of the variability of the azygos venous system is an important anatomical sign post in guiding radiological diagnosis and in the surgical treatment of thoracic aorta aneurysms and tumours of the posterior mediastinum.

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