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STUDY OF THE AZYGOS SYSTEM OF VEINS IN HUMAN CADAVER

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ABSTRACT

Objectives: To investigate the origin, course, relations, tributaries and terminations of azygos system of veins in human cadavers. **Methods:** A total number of 100 specimens (Foetuses: 10, Children: 8, Adults: 82) were selected for this study. **Results:** The azygos vein is formed by the union of ascending lumbar vein and subcostal veins in 88% of subjects and subcostal veins alone in 12% of subjects. The termination of azygos vein took place at the level of 4th thoracic vertebra in 85%, 3rd thoracic vertebra in 8% and 5th thoracic vertebra in 7% of subjects. **Conclusions:** The anomalies of azygos vein, hemiazygos, and accessory azygos veins are very rare. The variations in the azygos system of veins are utmost importance for thoracic surgeons because vulnerability of damage during surgical procedure.

Keywords: Azygos vein, Foetus, variation, Superior vena cava

INTRODUCTION

The name azygos derived from Greek, which means unpaired. The Azygos system is a main channel of drainage of the thoracic wall and also part of parities of abdomen. Azygos vein is formed by joining the right ascending lumbar and sub costal veins in posterior mediastinum (FIG: 01). After the formation it passes forward and to the right of the twelfth thoracic vertebra behind the right crus of diaphragm. At the level of the fourth thoracic vertebra, it arches forward above the right pulmonary hilum then it terminates into superior vena cava. The hemiazygos vein is formed by the left ascending lumbar and sub costal veins, and then it ascends upwards ends in azygos vein at the level of eighth thoracic vertebral level. The accessory hemiazygos vein is formed by veins from fourth or fifth to eighth left inter costal spaces, then it crosses the seventh thoracic vertebra to join the azygos vein ^[1].

MATERIALS AND METHODS

The materials selected for this present study were human cadavers and fetuses. A total number of 100 specimens (TABLE: 01) were obtained from the department of Anatomy, forensic medicine and Gynaecology & Obstetrics of Kurnool medical college, Kurnool, Andhra Pradesh, India.

The selected cadavers were preserved by injecting with routine embalming fluid. Cadavers from department of forensic medicine were dissected immediately after the autopsy. Received fetuses were fixed by 10% formalin into the serous and cranial cavities and preserved in embalming tank fluid.

The preserved fetuses and cadavers were taken and the thoracic and abdominal cavities are opened by a midline incision from the supra sternal notch to pubic symphysis. The thoracic and abdominal organs were removed by dissection then observed the commencement and

termination of azygos vein into superior vena cava. All the posterior intercostal veins are cleaned to the site of their termination into the azygos vein. The communications of the hemiazygos, accessory azygos veins into azygos vein are identify and cleaned by reflecting the oesopagus and aorta.

RESULTS

In the present study we concluded the, mode of formation of azygos vein, its deviation and side shifting and its termination related to vertebral level. A total number of 100 specimens, the azygos vein (FIG: 01) formed by the union of ascending lumbar vein and subcostal veins in 88% of subjects, where as it is formed by subcostal veins alone in 12% of subjects (TABLE: 02). Out of 10 fetuses and 8 children the azygos vein was right anterolateral aspect of vertebral bodies. In all adult cadavers up to 45 years age group the azygos vein was located right side, but age group between 45 to 70 years the azygos vein was found to be crossing the midline towards the left side (FIG: 02).

In the present study the level of termination of azygos vein into superior vena cava was varying considerably, in adults, fetuses and children. Out of 82 adult cadavers 7 were terminated at third and 75 were at fourth thoracic vertebra. Out of 10 fetuses one at third, two at fourth, and seven at the level of fifth thoracic vertebra. In all the 8 cadavers of children azygos vein terminated at the level of fourth thoracic vertebra (TABLE: 03).

Hemiazygos vein is crossing the midline towards the right side at the level of eight thoracic vertebra in 70 % of subjects and at the ninth thoracic vertebra in 3 % of subjects. The formation, course and termination of accessory hemiazygos vein observed normal.

DISCUSSION

Kagami *et al* ^[2] studied azygos system of veins in a total number of 26 adult human bodies and

10 fetuses, in 22 out of 26 bodies the azygos vein crosses the midline of vertebral column from right to left, in 3 bodies azygos vein ascending in midline, and one body azygos vein ascending on the right side of vertebra column. Mac mahon *et al* ^[3] observed the congenital absence of azygos vein, is a cause for aortic nipple enlargement. Lindsay *et al* ^[4] reported the abnormal hemiazygos vein. Seib *et al* ^[5] conducted a study on azygos system of veins in American whites and Negroes. Gladstone *et al* ^[6] conducted study on development of inferior vena cava, he observed the abnormalities in ascending lumbar and azygos vein. Chiiba *et al* ^[7] reported a rare case of persistence left azygos vein in a left lung. According to Celik *et al* ^[8] anatomical knowledge about the variations of azygos systems of veins are important in radiological diagnosis like CT and MRI techniques and also in the surgical treatment of aneurysms of thoracic aorta and posterior mediastinal tumours. According to Elzbieta Krakowiak Sarnowska *et al* ^[9] studies, out of 32 human fetuses the azygos vein situated 90.6% on right side, 9.4 % on median side and the azygos vein terminated at the level of T4 and hemiazygos vein at the level of T7. Kadir *et al* ^[10] observed the termination of azygos vein seen at T4, T5 and hemiazygos vein at T7 level.

The variations of azygos, hemiazygos, and accessory hemiazygos veins are existed in associated with congenital anomalies of the heart, arteries, and veins, like doubling of superior and inferior vena cava. Cotter *et al* ^[11] demonstrated double superior vena cava in three human hearts. Mori *et al* ^[12] reported double superior vena cava in 2 cases out of 300 Japanese cadavers. Morton *et al* ^[13] reported pre aortic anastomotic channel between azygos and hemiazygos veins.

CONCLUSION

Azygos vein was formed by ascending lumbar vein and subcostal veins in 88% of subjects and

only by subcostal veins alone in 12%. Termination of azygos vein seen at the T4 level in 85%, T3 level in 8% and T5 level in 7% of subjects. The present study concluded the deviation of azygos vein that was due to ageing basis. The hemiazygos vein crossing to right side at T7 level in 70%, T9 level in 3% of subjects.

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Table: 01: Particulars of the specimens dissected

SI.NO	AGE GROUP	SEX	TOTAL
1	Foetuses	A. Male	6
		B. Female	4
2	Children	A. Male	4
		B. Female	4
3	Adult	A. Male	52
		B. Female	30
			100

Table: 02 showing the mode of formation of azygos vein

S.NO	Mode of formation of azygos vein	Foetuses			Children			Adults			Total
		M	F	Total	M	F	Total	M	F	Total	
1	Ascending lumbar and Subcostal vein	5	4	9	4	4	8	45	26	71	88
2	Only subcostal vein	1	0	1	0	0	0	7	4	11	12

Table: 03 showing the termination of azygos vein in related to vertebral level

S.NO	SPECIMEN TYPE	NO.OF SPECIMEN	T3	T4	T5	TOTAL
1	Adults	10	1	2	7	10
2	Foetuses	8	0	8	0	8
3	Children	82	7	75	0	82

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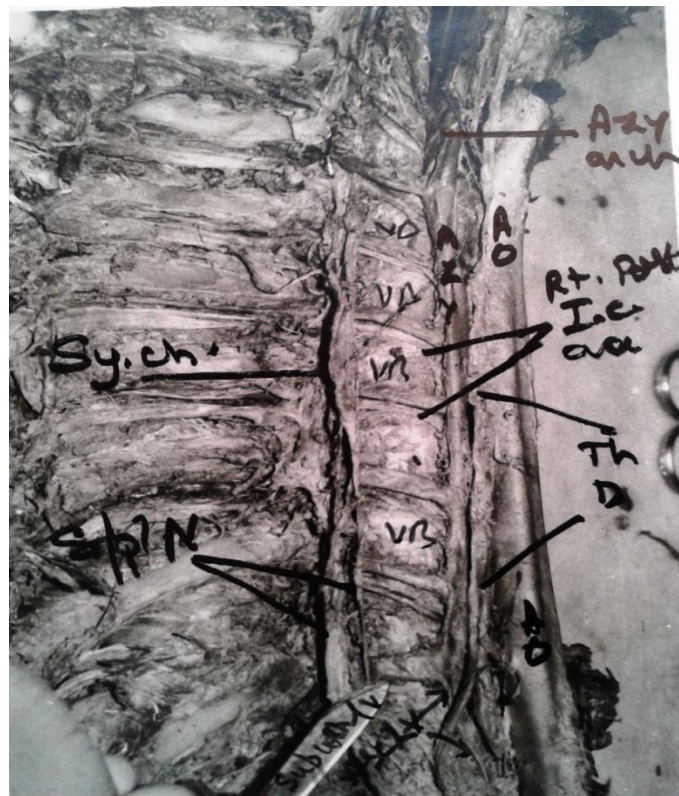


FIG: 01: showing the formation, course and relation of azygos vein (Azy: azygos vein, AO: Abdominal aorta, Asc Lv: Ascending lumbar vein, Subcostal Vein, Th D: Thoracic duct, Rt Post IC AV: Right posterior intercostals arteries & veins)



FIG: 02: showing the shift of azygos vein towards the midline in mid thoracic level. **AZY:** Azygos vein, **AO:** Abdominal aorta -> shows deviation.