

Anomalous accessory hemi-azygos system with persistent cranial segment of posterior cardinal vein - A case report

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Abstract

Anomalies of the azygos system of vein are not uncommon. The case presented here exhibits persistent cranial part of the left posterior cardinal vein. This embryological variation gives rise to a well developed venous channel to the left side of the aortic arch and the thoracic aorta and drains the upper six left intercostals spaces. The superior intercostal vein on the left drains into this venous channel. The channel itself drains into the left brachio-cephalic vein after crossing the arch of aorta vertically on its left. Any communication between this anomalous channel and the azygos system on the right couldn't be found. The inferior hemi-azygos system on the left is rudimentary. This persistent cephalic part of the posterior cardinal vein serves as a communication between the superior hemi-azygos vein to the brachio-cephalic vein on the left side. The existence of such an anomaly, the position of this vein and its proximity to the structures near the arch of aorta should be taken into consideration to avert radiological mis-diagnosis and surgical complications.

Keywords: azygos system, posterior cardinal vein, hemi-azygos vein, brachio-cephalic vein, oblique vein of left atrium.

1 Introduction

Anomalies of the azygos system of veins are not uncommon. Several variations are reported in the literature (BUTLER and BALANKURA, 1952; DAVIS, MILLOY and ANSON, 1958; BRENNER, CLEMENT, FREDERICK et al., 1974; CELIK, SARGON, ALDUR et al., 1996) and these deviations in the patterns of this venous system result predominantly due to its complex embryological development (PILLET, MERCIER, CHRONIER et al., 1986; COSCINA, ARGER, MINTZ et al., 1986; MEZZOGIORNO and PASSIATORE, 1988; BERGMAN, AFIFI and MIYAUCHI, 2009). The azygos system of veins develop from a pair of longitudinal venous lines, called the right and left azygos venous line, on either side of the aorta. On each side, the azygos venous line lies parallel to another two parallel primitive venous lines called the right and left subcardinal and post cardinal veins. A longitudinal communication called the supracardinal vein exists between the proximal and the distal parts of the posterior cardinal vein. The right azygos venous line develops into the vertical part of the azygos vein. The arch of the azygos is contributed partially by the persistent cephalic part of the right posterior cardinal vein. The caudal end of each azygos venous line joins with the corresponding sub-cardinal vein close to the level of the inter-subcardinal anastomosis. Thus the azygos vein begins as the ascending lumbar vein on both sides. The fate of the azygos venous line on the left is different. Due to the development of an oblique communication between the right and the left anterior cardiac veins, the distal part of the left anterior cardinal vein, the cranial part of the left posterior cardinal vein and the left common cardinal vein regress greatly. The first of the two structures mentioned

above give rise to the left superior intercostal vein in unison. The oblique vein of the left atrium represents the attenuated remnant of the left common cardinal vein (OZBEK, DALEIK and COLAK, 1999). The rest of the longitudinal systems of veins disappear around the azygos venous system on both the sides. The primary azygos venous line on the left gives rise to a set of longitudinally arranged veins. The lengths of these veins are almost half of the azygos vein on the right side and are thus called the hemi-azygos veins. The upper set, named the superior or accessory hemi-azygos veins, drain the fourth to the sixth intercostals spaces posteriorly. The lower part of the azygos venous line gives rise to the inferior hemiazygos vein that arises as the left ascending lumbar vein, similar to the azygos vein on the right, draining the seventh and lower intercostals spaces. The accessory hemiazygos and the hemiazygos veins usually are independent systems and connect to the azygos vein with two transversely oriented veins at the levels of the seventh and eighth thoracic vertebrae. These transverse channels embryologically are derived from such connections between the right and the left posterior cardinal veins (STANDRING, 2005). Reported variations in the development of the azygos system of veins include partial or complete genesis of the components of the system. Pre-aortic connections between the right and left components of this venous system have been reported (GRZYBIAK, SZOSTAKIEWICS-SAWICKA and TREDER, 1975). Complete agenesis of the accessory hemi-azygos vein has been reported by Ozbek, Daleik and Colak (1999) with a predominant left superior intercostal vein draining the upper intercostal spaces. The current report is about a very well developed accessory hemi-azygos

like vein that drains the upper intercostals spaces and joins the left subclavian vein crossing vertically across the arch of aorta. This long vein is situated on the left of the arch and the thoracic part of aorta and does not communicate with the azygos vein. The left superior intercostals vein drains independently into this venous channel before it opens into the brachio-cephalic vein.

Though the anatomical variations in the azygos system are physiologically normal, it is important to be aware of the unique yet normal variations of the azygos venous system during mediastinal surgeries to prevent inadvertent hemorrhagic complications (BRENNER, CLEMENT, FREDERICK et al., 1975). Confusion can be avoided in diagnosing these structures after detection in scans and MRI (SMATHERS, LEE and HEIKEN, 1983; TAKASUGI and GODWIN, 1990). Co-existence of associated anomalies of the heart, spleen, the superior vena cava and abdominal situs has been reported with anomalies of the azygos system, especially if associated with azygos veins that continue with the inferior vena cava (MINNITI, VISENTINI and PROCACCI, 2002; VIJAYVERGIYA, BHAT, KUMAR et al., 2005; CHURCHILL, WESBY, MARSAN et al., 1980).

2 Material and methods

The present case study concerns one of the unique types of variations associated with the azygos venous system. It was detected at the routine undergraduate dissection session at our institute. The cadaver belonged to a 64 year old man who died of cardio-respiratory arrest. On dissecting the posterior mediastinum on the left side, it was noticed that a very well developed 'accessory hemiazygos like' vein rested to the left and parallel to the descending aorta. On further dissection it was revealed that 1) this long vein was of 15 cm in length; 2) it drained the posterior parts of the 3rd to the 7th intercostals spaces; 3) the vein crossed superficial to the arch of aorta; and 4) opened into the left brachio-cephalic vein (Figure 1). The position of the left vagus nerve was deep to this structure whereas the phrenic nerve remained superficial to this vein and normally embedded on the pericardium. The left brachio-cephalic vein exhibited normal openings for the pericardiophrenic, the left superior intercostal vein and the internal thoracic veins of the left side. The azygos vein, the superior vena cava and the inferior vena cava were normal. No communication was noted between the caudal end of this well developed venous system on the left with the azygos vein on the right. The lower posterior intercostals veins on the left drained into a thin, transversely oriented and retro-aortic channel that drained into the azygos vein in the right side. No prominent inferior hemiazygos vein could be located on the left. The cardiovascular system and both the lungs showed no gross anomaly.

3 Discussion

As stated in the introduction, development of the azygos system may accompany several variations. These variations may range from redistribution of the areas of drainage of the azygos, the hemiazygos and the accessory hemiazygos veins; variations in the origin and the modes of termination of the veins to the complete agenesis of the components of

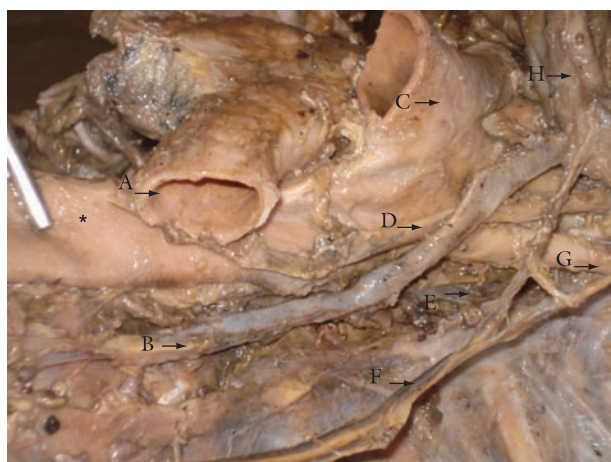


Figure 1. Figure showing the course and relations of the Accessory Hemi-Azygos vein draining into the left Brachio-cephalic vein. A) Left principle Bronchus, B) Anomalous venous channel, C) Arch of Aorta, D) Left Vagus nerve, E) Left Superior Intercostal vein, F) Phrenic nerve & Pericardio-phrenic vessels, G) Left Subclavian Artery, H) Left Brachio-cephalic vein. Thoracic Aorta (*).

this venous system. The present case resembles possibly the reverse of a case reported earlier (OZBEK, DALEIK and COLAK, 1999). The case had reported a complete absence of the hemiazygos vein with the lower posterior intercostal veins and the left subcostal veins draining independently into the azygos vein. The fifth and sixth left posterior intercostal veins joined with the third and fourth ones and opened to left superior intercostal vein. This superior posterior intercostals vein on the left practically drained the entire posterior thoracic wall on the left side. A review of the case presented by Özdemir, Aldur and Çelik (2002) also states that in absence of the hemiazygos vein, the left superior intercostals vein formed the terminal conduit for the entire upper left posterior thorax for its venous drainage.

The deviations reported in this study can be explained as variations in the embryonic development of the azygos venous line on the left side (STANDRING, 2005). The cranial part of the azygos venous line in the left is well developed draining the majority of upper intercostal spaces. This Hemi-azygos vein extends cranially to join with the left brachio-cephalic vein. The first superior left intercostal vein is 'normal' in the sense that it has a separate identity draining the upper two intercostals spaces but terminating into this undefined long venous channel. Embryologically this can be explained by the persistence of cranial part of the left posterior cardinal vein that forms a direct communication between the cranial part of the Azygos line in the left and the 'oblique communication' represented by the left brachio-cephalic vein. Communication between the oblique vein of the left atrium and the superior intercostal vein on the left was not discernable. The embryological event of non-regression of the terminal parts of the posterior cardinal veins, speculated to be the reason of the variation in this case, is further substantiated by the observation that the superior left intercostal vein ends in this long venous channel and this channel itself joins the left brachio-cephalic vein.

The vein in question here may be an accessory hemi-azygos vein with an added cranial extension into the remaining and persistent cephalic part of the left posterior cardinal vein. This vein crosses vertically across the arch of the aorta and not obliquely as the superior intercostals vein does on the left (in normal cases) and the channel has a separate opening for the left superior intercostal vein. It is handy to have a prior awareness of the possible variations of this venous system to circumvent confusions regarding its diagnosis and complications during mediastinal procedures.

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