

Subaortic Left Brachiocephalic Vein

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ABSTRACT

Subaortic left brachiocephalic vein is a rare congenital anomaly that is sometimes found in the normal population. We report here on a case of subaortic left brachiocephalic vein that was detected incidentally by performing contrast transesophageal echocardiography (TEE) with using agitated saline and computed tomography (CT). (Korean Circulation J 2006;36:605-607)

KEY WORDS : Congenital disorders ; Brachiocephalic veins ; Transesophageal echocardiography.

Introduction

The subaortic left brachiocephalic vein is a rare congenital anomaly even among those individuals who are suffering with cardiac malformation, and its incidence is presumed to be very much lower in the population at large.

We present here a case of subaortic left brachiocephalic vein that was diagnosed by TEE and CT, and we also offer a brief discussion of the medical literature that is related to this rare condition.

Case

A 63-year-old man was admitted to our hospital complaining of severe left anterior chest pain of an atypical character. His initial blood pressure was 170/90 mmHg; however, his other vital signs, an electrocardiogram and the routine lab findings were all within normal ranges. We performed a chest X-ray and transthoracic echocardiography (TTE). The posteroanterior chest radiograph showed elongation of the patient's aorta, but it was otherwise normal. In addition, the TTE revealed no abnormality. We then decided to perform a test with TEE to rule out such aortic disease as aortic dissection or intramural hematoma as the cause of the patient's chest pain. What we found was

an anomalous structure under the aortic arch. Nevertheless, the diagnostic color or Doppler flow pattern didn't display that structure, so we used an agitated mixture to obtain a clear image and to understand the anomalous structure. After injecting an agitated mixture of 10% air, 10% blood and 80% saline into the left antecubital vein¹⁾ at the bedside, the structure was well enhanced and we presumed this structure to be a vein (Fig. 1). In order to precisely identify the anomalous structure, we performed sequential contrast-enhanced chest CT, and this revealed both the non-visualized left brachiocephalic vein in the normal location and the presence of the contrast-filled anomalous brachiocephalic vein that was lateral from the aortic arch (Fig. 2). The vein ran downward along the lateral border of the aortic arch, passed through the aortopulmonary window, crossed the mediastinum posteriorly to the ascending aorta and anteriorly to the trachea, and it finally joined the right brachiocephalic vein to form the superior vena cava. The mediastinum, both lungs and the other cardiovascular structures were all normal.

Discussion

Subaortic left brachiocephalic vein is a congenital anomaly that is less common in the thoracic venous systems than for anomalous positions of the superior vena cava or azygos vein. In fact, the incidence of this condition in the general population has been reported to be from 0.06-0.37%, and the detected incidence among the patients with congenital heart disease is from 0.15-0.98%.²⁾ It is known that the features commonly seen in Tetralogy of Fallot, i.e., right aortic arch,

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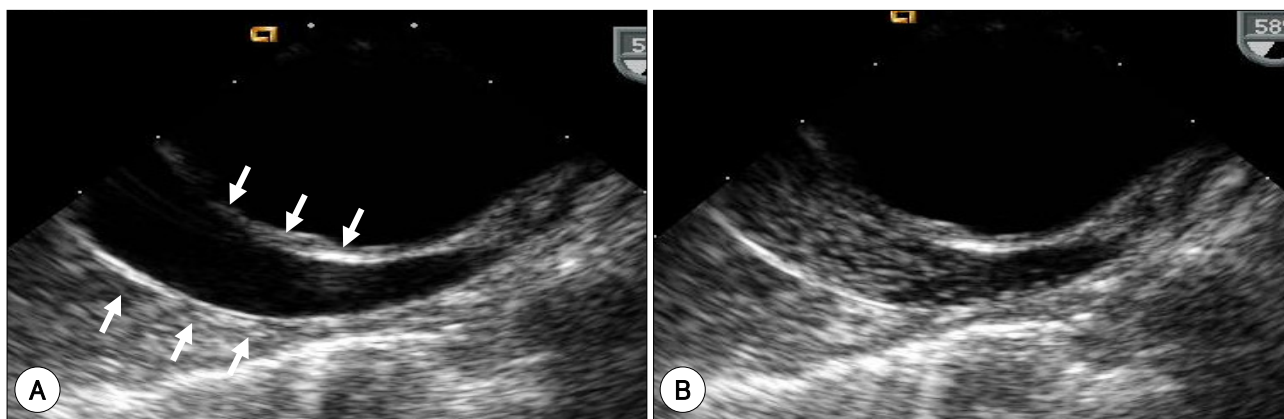


Fig. 1. Transesophageal echocardiography shows the left brachiocephalic vein (arrows) under the aortic arch (A). Enhanced by the injection of agitated saline (B).

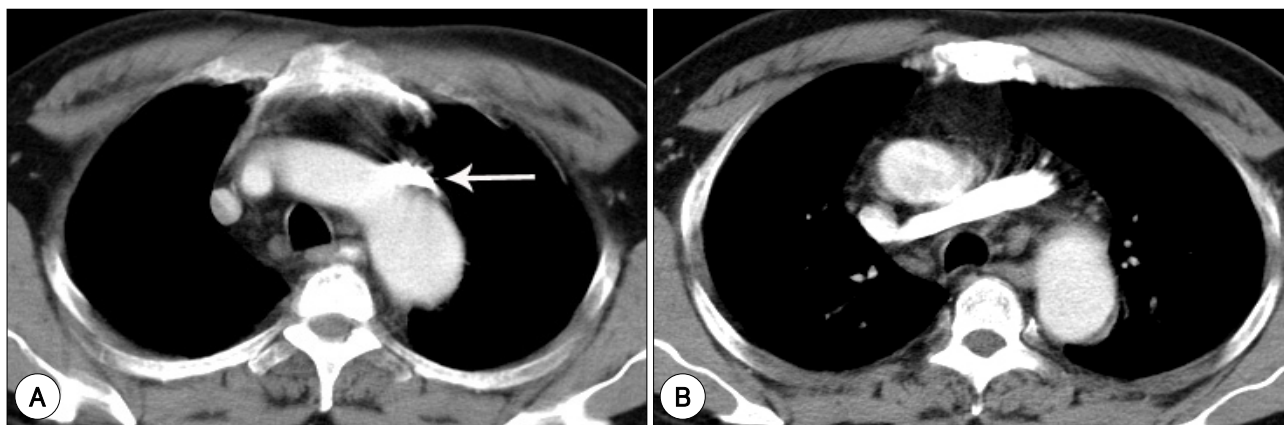


Fig. 2. Sequential contrast-enhanced chest CT scans show a contrast-filled anomalous brachiocephalic vein (arrows) lateral to the aortic arch (A). The vein (arrows) passes through the aortopulmonary window, traverses the mediastinum posteriorly to the ascending aorta and anteriorly to the trachea, and joins the right brachiocephalic vein to form the superior vena cava (B).

ventricular septal defect and right ventricular outflow obstruction, are the cardiac malformations most frequently associated with subaortic left brachiocephalic vein.³⁾ The detection rate for this malady has increased with the advanced technological capacity of the noninvasive modalities.

The exact pathogenetic mechanism leading to subaortic left brachiocephalic vein is still unknown, but there are several hypotheses. The brachiocephalic veins and superior vena cava originate from the right and left precardial veins. Each precardial vein joins its ipsilateral posterior cardinal vein to form the common cardinal vein that flows into the sinus venosus. In the eighth week of fetal development, the precardial anastomosis develops between the two precardial veins. Subsequently, the left precardial vein disappears, causing the blood flow from the left head and neck regions to be carried mainly via the precardial vein. This anastomosis develops into the left brachiocephalic vein. The normal precardial anastomosis develops ventrally to the arterial structures. Anomalous left brachiocephalic vein is thought to result from the precardial

anastomosis being situated posteriorly to the truncus arteriosus, and double left brachiocephalic vein is the consequence of both ventral and dorsal precardial anastomosis.⁴⁾

Minami et al.⁵⁾ and Kim et al.⁶⁾ have suggested that subaortic left brachiocephalic vein can form secondarily when the elongation of the aortic arch prevents the normal precardial anastomosis; the vein then develops either anteriorly or posteriorly to the aortic sac, wherever more space is available. Elongation of the aortic arch results in narrowing of the prevascular space and widening of the subaortic space between the aortic arch and the pulmonary artery; this widening increases the chance for the development of precardial anastomosis posteriorly to the aortic sac.

Morhy Borges Leal et al.⁷⁾ have described their experience with 14 patients who had this lesion identified via echocardiography, and 12 of them experienced right ventricular obstruction. With the advent of cross-sectional echocardiography, the anomalous course of the left brachiocephalic vein can readily be identified non-invasively from the suprasternal notch.

Although the subaortic brachiocephalic vein anomaly usually has no clinical implications, it must be distinguished from other major vessels and especially on a preoperative cardiovascular examination because it is located beneath the aortic arch. On chest CT, it must be differentiated from a persistent left SVC, an atrophic right pulmonary artery and other vascular structures. This is easily accomplished by performing CT with using contrast medium.⁴⁾ A radiographic characteristic of subaortic left brachiocephalic vein is that it mimicks the characteristics of mediastinal hematoma. Mediastinal widening and an apical pleural cap seen on chest radiography may indicate the presence of a mediastinal hematoma, which is caused by major vessel injury, and so further investigation is essential in the case of acute chest trauma.⁸⁾ With using echocardiography, the anomalous vein is most likely to be identified as the right pulmonary artery. However, with the physician exercising proper awareness and care, the use of an air-blood-saline mixture makes it possible for the echocardiographer to visualize the anomalous vessel beneath the aortic arch, parallel and anterior to the right pulmonary artery and the other vascular structures, as we were easily able to do.⁹⁾

The subaortic left brachiocephalic vein is a rare congenital anomaly in the general population. It is important for physicians to be well informed about this condition so that they do not fail to detect it nor mistake it for other anomalous cardiovascular structures. Detection can be easily achieved by ascertain-

ing the exact venal pathway via contrast transesophageal echocardiography with using agitated saline and CT.

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