CASE REPORT

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Isolated dilatation of the inferior vena cava

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The diameter and collapsibility of the inferior vena cava (IVC) should be interpreted in consideration with other clinical and echocardiographic parameters before drawing definitive diagnostic conclusions. We report a case of a 46-year-old female with isolated IVC dilation and diminished inspiratory collapse without other abnormalities, and provide a brief review of the literature.

Keywords: Vena cava, inferior; Echocardiography; Cardiac catheterization

INTRODUCTION

The diameter of the inferior vena cava (IVC) and degree of inspiratory collapse are used as indices in the echocardiographic estimation of right atrial (RA) pressure. Under normal RA pressure, the maximum IVC diameter is less than 20 mm, and the inspiratory collapse is more than 50%. Under high RA pressure, the IVC is dilated (more than 20 mm) and the inspiratory collapse of IVC is diminished. We report a case of a female patient with dilated IVC with normal RA pressure. This condition is rare [1], and to our knowledge, this is the first case of isolated dilatation of the IVC reported in Korea.

CASE REPORT

A 46-year-old female underwent abdominal computed tomography (CT) imaging at a private clinic due to mild right upper quadrant abdominal discomfort and back pain during the previous 2 weeks. She was referred to our hospital to evaluate the cause of IVC dilatation shown by abdominal CT (Fig. 1). The patient had no history of hypertension or diabetes mellitus and no family history of aortic, collagen, vascular or congenital heart disease. She had latent hepatitis B virus infection and her mother died of hepatocellular carcinoma. Ultrasonography of the liver showed hepatic vein dilatation without obstruction or thrombus in either the hepatic vein or IVC. The abdominal CT showed prominent dilatation of the IVC and hepatic vein with no evidence of liver disease such as cirrhosis, hepatocellular carcinoma or Budd–Chiari syndrome. Her vital signs included blood pressure of 107/64 mmHg, pulse of 60 beats per minute, respiration of 20 breaths per minute, and body temperature of 36.5°C. During the physical examination, cardiac auscultation revealed no definite murmurs and her electrocardiography demonstrated

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no apparent ST segment or T wave abnormalities. The blood chemistry analyses were within normal limits, including N-terminal pro-B natriuretic peptide, coagulation studies with fibrinogen, antinuclear antibody, complete blood cell count, and liver enzymes. Her heart size was normal on chest X-ray. Transthoracic echocardiography was performed to evaluate right side heart abnormalities. Dilated IVC with diminished inspiratory collapse was observed (expiration 24.3 mm, inspiration 21.4 mm) using a subxiphoid approach to view the IVC along the longitudinal axis (Fig. 2). Spontaneous echo contrast was present in the dilated IVC without flow obstruction including the entry from the RA. The hepatic vein was dilated mildly (13.2 mm), but the flow through the hepatic vein was normal (Fig. 3A). Tricuspid regurgitation (TR) was mild and showed normal right ventricular (RV) systolic pressure (Fig. 3B). Normal pulmonary artery (PA) pressure without regurgitation or stenosis (Fig. 3C) and normal flow of the superior vena cava were observed. The RV size and its contractility were normal with a normal degree of tricuspid annulus displacement toward the apex in the systole (1.75 cm). Additionally, we observed normal left ventricle (LV) size and LV systolic function (ejection fraction = 68%) without regional wall motion abnormalities. Normal RA pressure, RV pressure, and PA pressure were observed (Fig. 4), and the RA pressure was decreased with an inspiratory effort (-2 mmHg). As the patient had no symptoms or abnormal signs, we observed her and plan to follow-up annually with echocardiography.

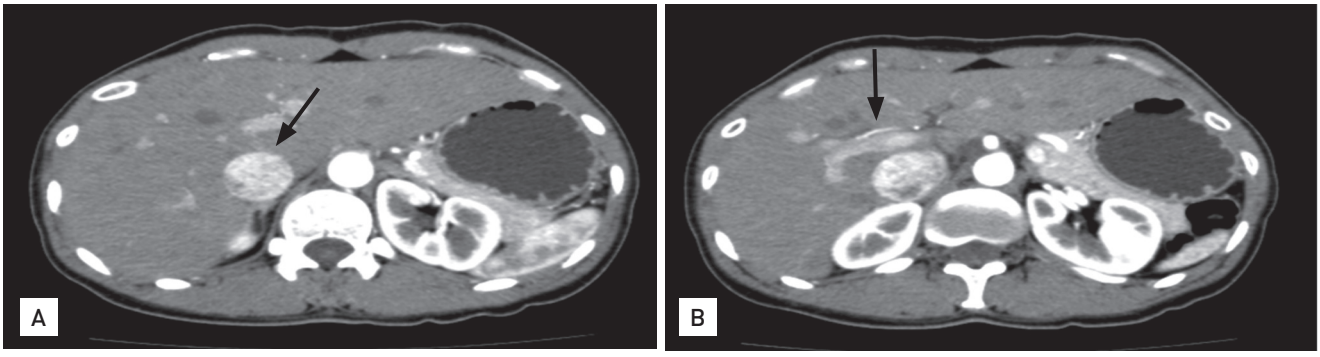

Figure 1. Abdominal computed tomography findings revealed no parenchymal liver disease or obstruction of the hepatic vein. Dilatation of the inferior vena cava (black arrow, A) and engorgement of the hepatic vein (black arrow, B) are shown.

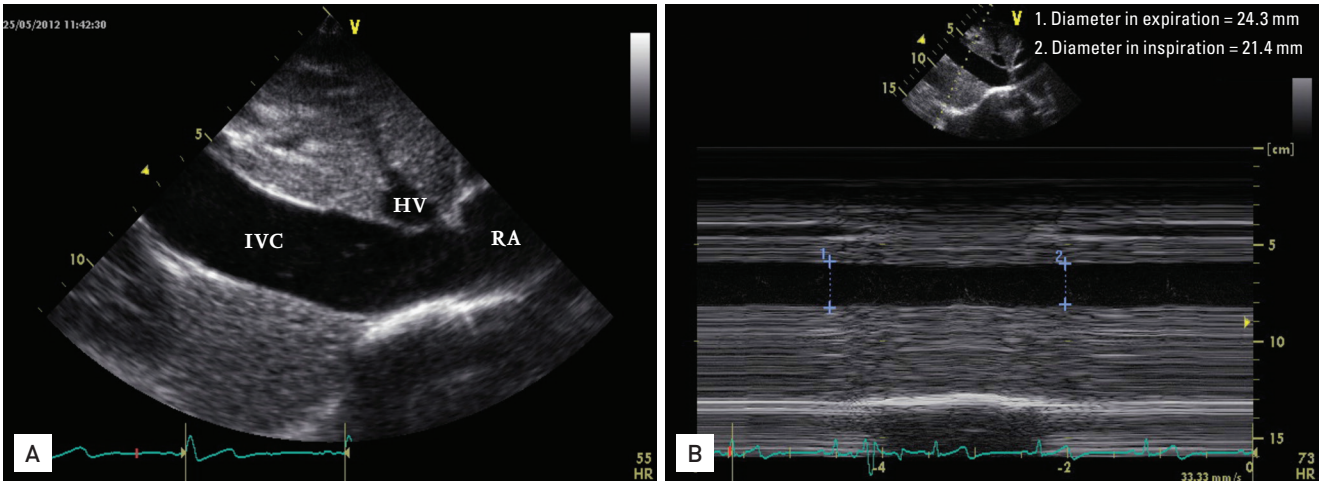

Figure 2. Transthoracic echocardiography showed dilatation of the inferior vena cava (IVC) (24.3 mm in diameter) (A) and diminished inspiratory collapse (B). HV, hepatic vein; RA, right atrial.

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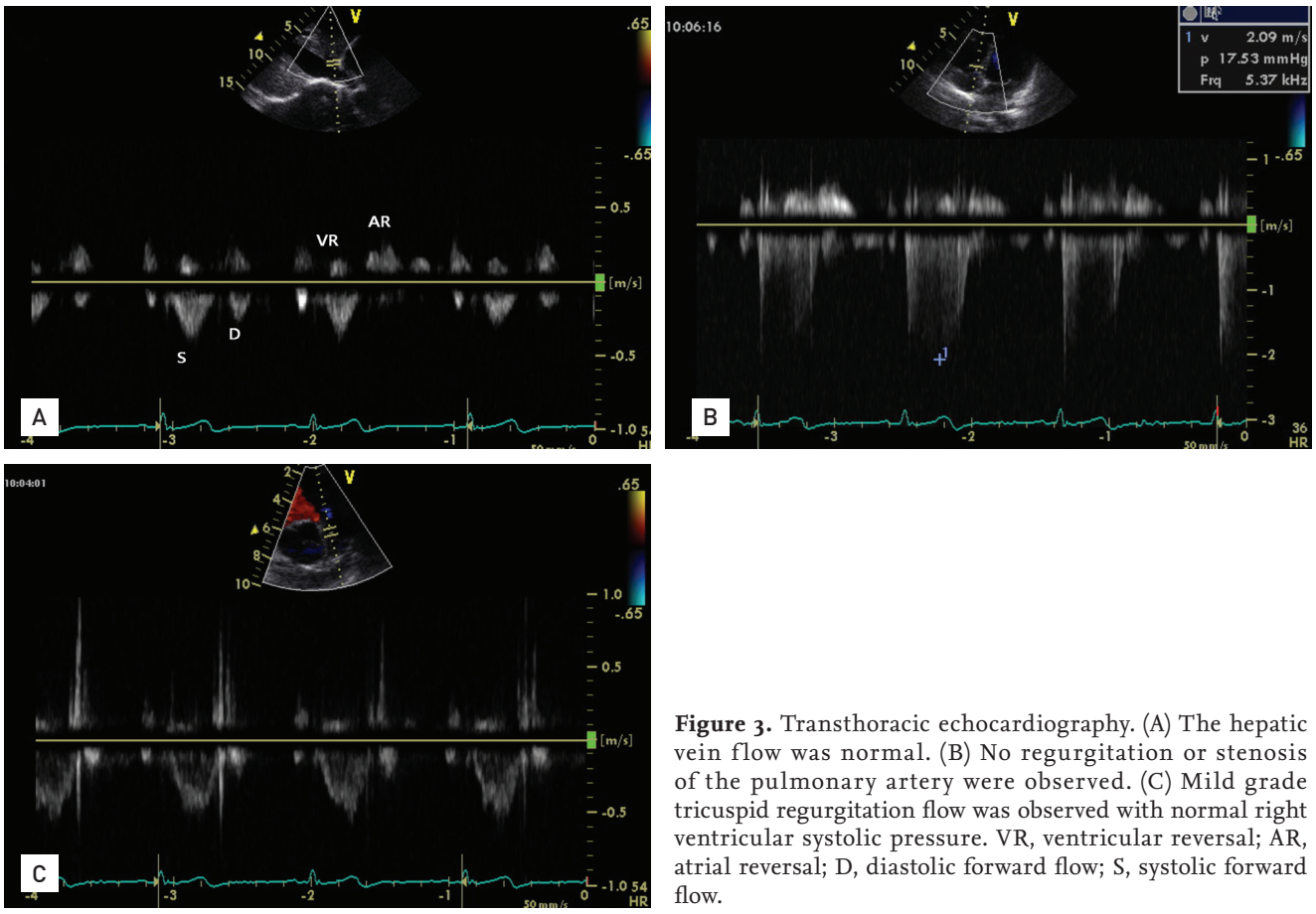

Figure 3. Transthoracic echocardiography. (A) The hepatic vein flow was normal. (B) No regurgitation or stenosis of the pulmonary artery were observed. (C) Mild grade tricuspid regurgitation flow was observed with normal right ventricular systolic pressure. VR, ventricular reversal; AR, atrial reversal; D, diastolic forward flow; S, systolic forward flow.

DISCUSSION

The IVC is a highly collapsible major vein, and its diameter correlates closely with right side cardiac functions [2,3]. The IVC diameter is altered with volume status and respiration, with higher IVC diameter during expiration than inspiration. An IVC diameter greater than 20 mm is commonly regarded as an upper limit of normal, which is a noninvasive indication of increased RA pressure in patients with cardiac or renal disease [4]. The RA pressure is correlated with the diameter and collapsibility of the IVC [5], and under normal RA pressure, the IVC diameter is decreased during inspiration [6]. In this case, the patient had increased diameter of the IVC (24.3 mm) with diminished collapsibility; however, there was no evidence of high RA pressure. IVC aneurysm can be seen in association with elevated right heart pressure, RV dysfunction, significant TR [7], none of which were present in this case. Moreover, the morphology of the IVC did not resemble that of an aneurysm. Ultrasonography of the liver and abdominal CT findings showed no liver disease and no mass-like leiomyoma. The possibility of Budd–Chiari syndrome [8] was ruled out as there was no thrombus or compression of the IVC. Additionally, normal hemoglobin and blood clot tests, and normal flow of the hepatic vein further excluding Budd–Chiari syndrome. We observed normal renal function including the serum glomerular filtration rate and normal kidney findings using the aforementioned imaging tests. Another study reported dilated IVCs in many competitive young athletes without heart disease [9]. However, our patient was a normal middle-aged housewife without regular exercise. With few reports in the literature of isolated dilatation of the IVC, the prognosis is unknown. A recent study suggested that dilated IVC in healthy subjects (without volume overload, pericardial disease and right heart abnormalities) might be a marker of decreased abdominal venous tone and/or increased compliance [10]. In conclusion, this patient had dilated IVC

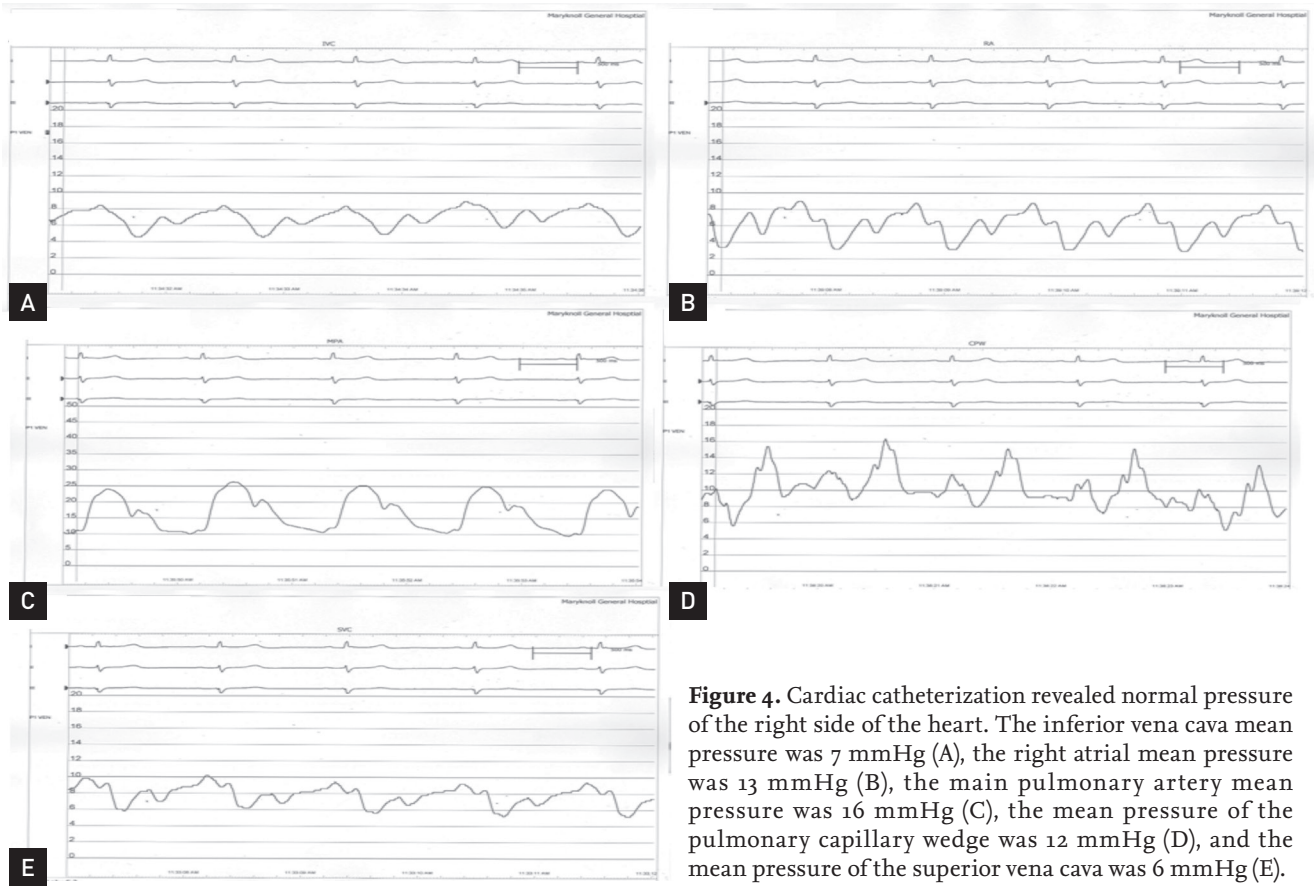

Figure 4. Cardiac catheterization revealed normal pressure of the right side of the heart. The inferior vena cava mean pressure was 7 mmHg (A), the right atrial mean pressure was 13 mmHg (B), the main pulmonary artery mean pressure was 16 mmHg (C), the mean pressure of the pulmonary capillary wedge was 12 mmHg (D), and the mean pressure of the superior vena cava was 6 mmHg (E).

and hepatic vein without evidence of heart problems or any other condition that could induce dilatation. This case shows that dilated IVC may not always indicate increased RA pressure in healthy adults. In addition to the IVC size, other echocardiographic and clinical findings should be considered when estimating RA pressure.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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