


CASE REPORT

Adrenal venous sampling in a patient with left inferior vena cava

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Introduction

Primary aldosteronism (PA) is a major cause of endocrine hypertension [1]. There are two major subtypes. One is unilateral PA, mainly due to aldosterone-producing adenoma (APA) and the other is bilateral PA, mainly due to idiopathic hyperaldosteronism (IHA). It is important to determine the PA subtype because the recommended treatment for APA is an adrenalectomy and that for IHA is pharmacological therapy with a mineralocorticoid receptor antagonist [2]. Adrenal venous sampling (AVS) is recommended for determining the PA subtype [3]. Regardless of its diagnostic efficacy, AVS is a difficult procedure. The catheterization of the right adrenal vein is particularly difficult because of its small diameter [4]. By contrast, the left adrenal vein is catheterized in almost all patients because it enters the left renal vein, which can be used as a guide to the left adrenal vein. However, in the rare case of an anomalous left adrenal vein, it is difficult to cannulate the left adrenal vein [5]. In this report, we describe the successful left adrenal vein cannulation under contrast-enhanced computed tomography (CT) guidance in a patient with PA and left inferior vena cava (IVC) whose left adrenal vein drained directly into the IVC.

Key Clinical Message

Adrenal venous sampling (AVS), although difficult, is recommended for patients with primary aldosteronism (PA) to diagnose the subtype. Recognizing anatomical variation is key to a successful AVS. We report on a patient with PA and left inferior vena cava (IVC) whose left adrenal vein drained directly into the IVC.

Keywords

Adrenal cortical hyperplasia, adrenal venous sampling, anatomical variation, hyperaldosteronism, left inferior vena cava.

Case Report

A 43-year-old man presenting with a 6-year medical history of hypertension was referred to our hospital for suspected PA. He was taking antihypertensive drug of amlodipine 5 mg. The laboratory data were as follows: creatinine, 0.67 mg/dL; plasma aldosterone concentration (PAC), 249 pg/mL; plasma renin activity (PRA), 0.7 ng/mL/h; and PAC/PRA ratio, 356. Captopril challenge test and saline infusion test confirmed the diagnosis of PA. Contrast-enhanced CT showed no adrenal tumor. CT also revealed that the left inferior vena cava joined the left renal vein and crossed over the aorta to the right side (Fig. 1).

Adrenal venous sampling was performed using a sheath inserted in the right femoral vein. The right adrenal vein was cannulated using a catheter. The left adrenal vein was then explored through the left renal vein. However, venography showed no left adrenal vein joining the left renal vein. A coronal section of the CT indicated that the left adrenal vein directly drained into the left IVC at a point close to the center of the left renal vein (Fig. 2). After examining the area, it was found that the left adrenal vein could be cannulated (Fig. 3A). However, a blood

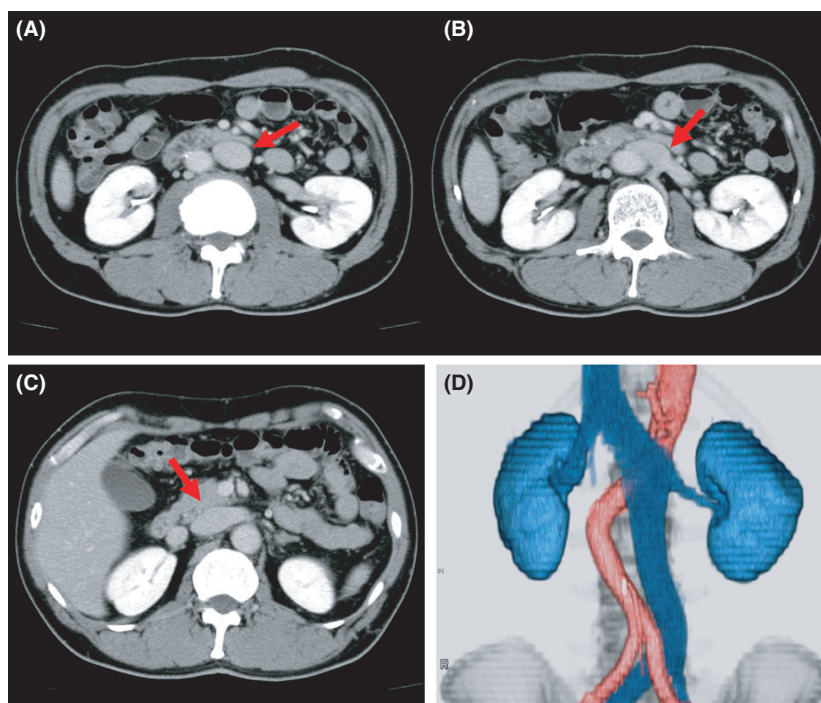


Figure 1. Abdominal CT scan showing the left IVC (arrow) inferior to the renal vein (A). The left IVC joins the left renal vein (B). Then, the IVC crosses anterior to the aorta in the normal side (C). Panel D showing 3D image.



Figure 2. A coronal CT section showing that the left adrenal vein (red arrow) drained into the left IVC directly at a point close to the center of the left renal vein (white arrow).

sample could not be obtained because the catheter was wedged; therefore, a multipurpose 4.2 French catheter was used to obtain a blood sample (Fig. 3B). AVS was performed after adrenocorticotropic hormone

stimulation. The patient was diagnosed with bilateral adrenal hyperplasia (Table 1) and treated with mineralocorticoid receptor antagonist.

Discussion

The IVC can present with a multitude of anatomical variations, such as double and left IVC, which are caused by complex embryonic developments. Based on the involvement of iliac and gonadal veins, several classifications have been proposed for IVC variations [6–8]. To perform a successful AVS, knowledge of possible anatomical variations related to adrenal vein drainage is crucial. For example, in patients with double IVC, the left adrenal vein may drain either directly into the IVC or into the left renal vein. In patients with left IVC, the left adrenal vein drains directly into the IVC [6]. In almost all individuals, the right adrenal vein drains directly into the IVC. Alper *et al.* reviewed the anatomy of adrenal veins [9].

Contrast-enhanced CT is useful in planning for AVS because it reveals the positions of the adrenal veins [5]. In this case, a coronal section of CT was helpful in detecting the left adrenal vein. Stack *et al.* reported a case where the left adrenal vein drained directly into the IVC [10]. To our knowledge, our patient is the first reported

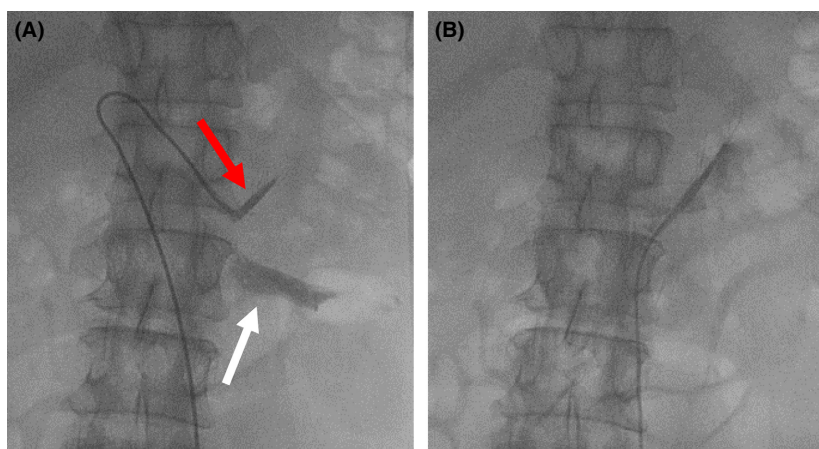


Figure 3. Panel A shows the left adrenal vein could be cannulated (red arrow) at a point close to the center of the left renal vein (white arrow) using CT guidance. Because the catheter was wedged, requiring a change in catheter to obtain a blood sample (B).

Table 1. Adrenal venous sampling results after adrenocorticotrophic hormone stimulation.

	Aldosterone (pg/mL)	Cortisol (μ g/dL)	Aldosterone cortisol ratio
Right adrenal vein	34,189	1130	30
Left adrenal vein	24,379	1100	22
Inferior vena cava	212	20	11

case of AVS being performed in the left IVC wherein the left adrenal vein directly into the IVC.

Conclusion

We report an unusual case wherein the left adrenal vein drained directly into the left IVC. This anomaly makes cannulation of the left adrenal vein for AVS difficult. Contrast-enhanced CT should be routinely performed in all patients undergoing AVS to rule out or clearly left any unusual anatomical variations that might complicate the procedure.

Authorship

YF and HT: drafted the article and conception of this study; YF and TU: performed the adrenal venous sampling; YU: performed the consultation and evaluation; YF: revised the article critically for important intellectual content.

Conflict of Interest

None declared.

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