Computerized Radiol. Vol. 8, No. 6, pp. 369–374, 1984
Printed in the U.S.A.

0730-4862/84 $3.00 + 0.00

CT OF UNUSUAL MEDIASTINAL VASCULAR ABNORMALITIES

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(*Received* 15 *March* 1984; *received for publication* 26 *July* 1984)

Abstract—The previously unreported CT findings of supracardiac anomalous pulmonary venous return and Takayasu arteritis are presented. CT demonstration of a left vertical vein and an enlarged superior vena cava strongly suggests a diagnosis of supracardiac anomalous venous return. Dynamic scanning of the mediastinum following bolus injection of urographic contrast with close attention to vascular enhancement patterns is required to suggest a diagnosis of Takayasu arteritis. CT is not the preferred diagnostic modality for either entity, but may prove definitive in some patients and may serve to triage other patients to the appropriate diagnostic modalities.

Thorax, computed tomography Takayasu arteritis Arteries, subclavian Pulmonary veins, abnormalities

INTRODUCTION

For several years, CT has been used to diagnose a wide variety of congenital and acquired mediastinal vascular abnormalities [1–14]. Dynamic rapid sequence scans after bolus injection of intravenous urographic contrast are particularly useful in evaluating vascular lesions or anomalies [8, 15]. We present previously unreported CT findings in 2 unusual mediastinal vascular abnormalities, anomalous pulmonary venous return and Takayasu arteritis.

CASE REPORTS

Case 1

A 47-yr-old woman presented in 1981 with a history of progressive shortness of breath, paroxysmal nocturnal dyspnea, and edema. A heart murmur and edema had first been noted during a pregnancy in 1953. In 1961 a right first stage thoracoplasty and right upper lobe resection were performed for pulmonary tuberculosis. On physical examination she appeared ill with tachypnea, cyanosis, and edema. Neck veins were distended. There were diffuse rales. Cardiac examination revealed a hyperdynamic precordium with displaced PMI, a right ventricular heave, a loud P_2, and S_3 and a III/VI systolic murmur at the apex. Arterial pO_2 was 41 mmHg and pCO_2 35 mmHg. Chest radiograph demonstrated cardiomegaly with pulmonary vascular congestion, a widened superior mediastinum, and post surgical changes [Fig. 1(a)]. Because of suspected valvular heart disease, the patient underwent cardiac catheterization, which revealed apparent anomalous pulmonary venous return from most of the left lung to the right atrium via a left vertical vein [Fig. 1(b)]. Venous return from the right lung appeared to pass normally into the left atrium. CT confirmed the anomalous vascular anatomy of the superior mediastinum [Fig. 1(c)].

Case 2

A 13-yr-old girl was evaluated for chronic anemia. For several weeks prior to admission, she had noted left shoulder pain with vigorous exercise. Physical examination was remarkable for an absent left radial pulse. CT, obtained to exclude a mediastinal mass causing vascular compression, demonstrated a narrowed descending aorta [Fig. 2(a)], but no mediastinal mass. In retrospect, there was delayed opacification of the left subclavian artery relative to the enhancement of the other great vessels [Fig. 2(b)]. Digital subtraction angiography revealed complete occlusion of the left subclavian artery with mild stenoses of the left common carotid and innominate arteries [Fig. 2(c)], consistent

Fig. 1. *Patient* 1. Supracardiac anomalous venous return. (a) Posteroanterior chest radiograph reveals abnormal cardiac and mediastinal contour, with a "figure eight" configuration. Pulmonary and lymph node calcifications and partial right thoracoplasty reflect old tuberculosis. (b) Subtraction view from right ventricular contrast injection demonstrates left vertical vein (V), left brachiocephalic vein (B) overlying branches of aortic arch, and faintly opacified and enlarged superior vena cava (SVC). A = ascending aorta, PA = pulmonary artery overlying descending aorta. (c) Contiguous CT sections from aortic arch to pulmonary arteries show enhancement of left vertical vein (V) and enlarged superior vena cava (SVC). AA = aortic arch, A = ascending aorta, DA = descending aorta, LPA = left pulmonary artery, RPA = right pulmonary artery.

with Takayasu arteritis. Following oral steroid therapy, there was resolution of shoulder pain with exercise.

DISCUSSION

Anomalous pulmonary venous return is an uncommon congenital abnormality of pulmonary venous drainage. In this condition pulmonary venous blood may return to the right atrium via a left vertical vein, the superior vena cava, the azygos system, the coronary sinus, a common trunk at the

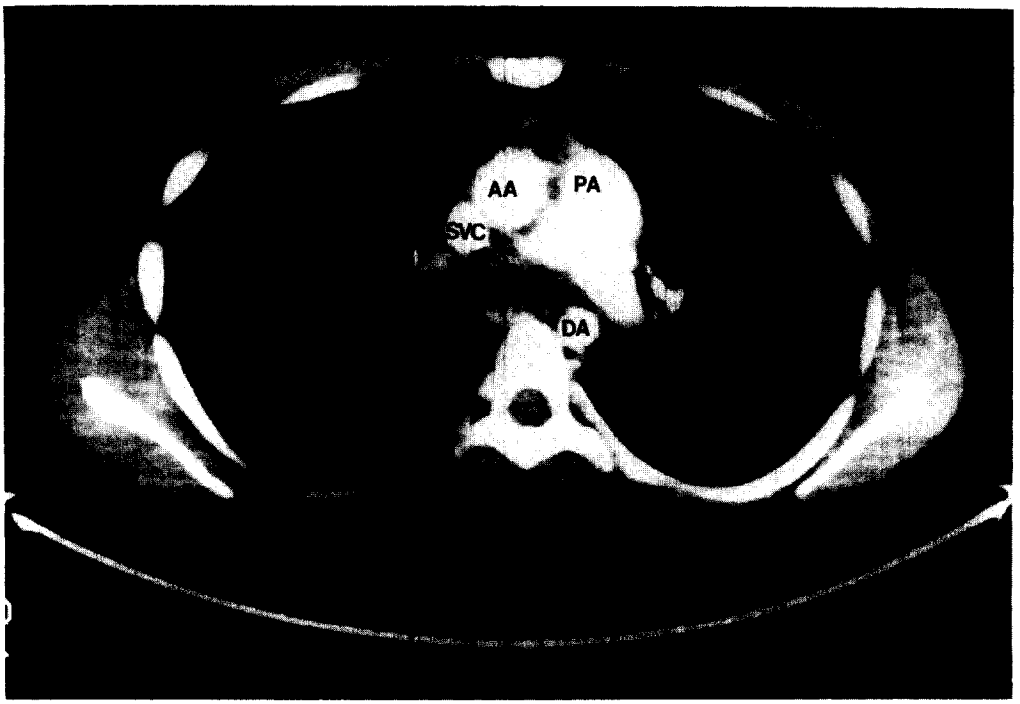

Fig. 2(a)

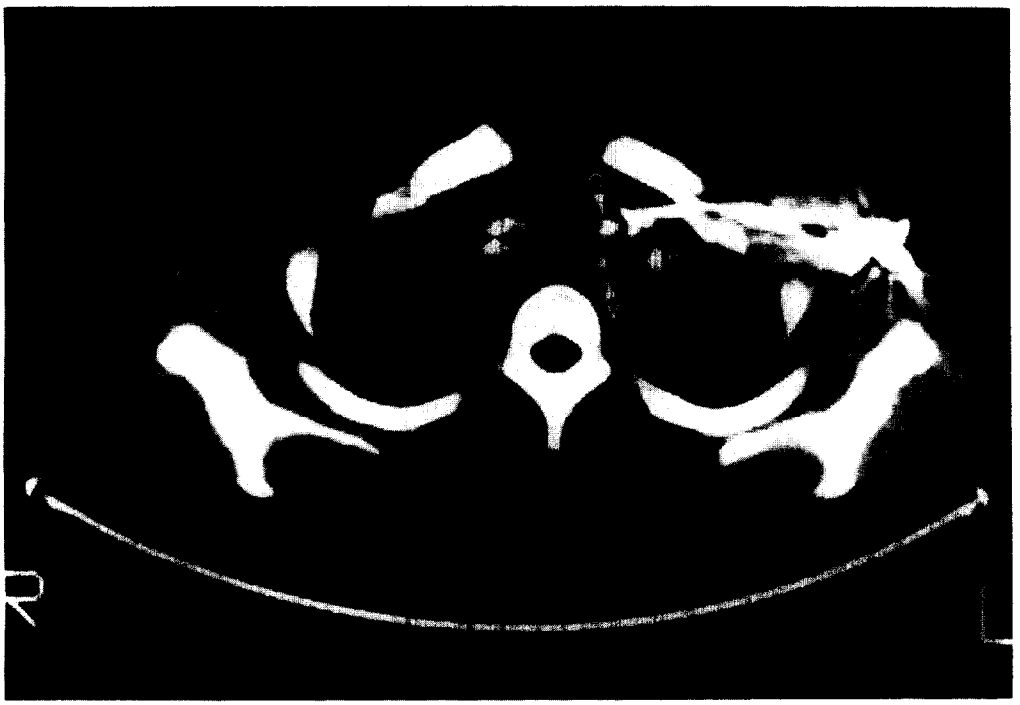

Fig. 2(b)

Fig. 2(c)

Fig. 2. *Patient* 2. Takayasu arteritis. (a) CT scan at the level of the carina during bolus injection of intravenous contrast reveals enlargement of ascending aorta (AA) compared to descending aorta (DA). PA = pulmonary artery, SVC = superior vena cava. (b) CT scan of the upper mediastinum during bolus contrast injection in a left arm vein demonstrates enhancement of left vertebral artery (V), left carotid artery (C), and innominate artery (I) without comparable enhancement of left subclavian artery (S). (c) Oblique view from digital subtraction angiogram shows proximal occlusion of left subclavian artery (arrow) with enlarged left vertebral artery (V) originating from aortic arch. A = aorta, C = left carotid artery, I = innominate artery.

level of the heart, or infradiaphragmatic veins [16]. With total anomalous return symptoms generally begin in early childhood, but some adult patients are surprisingly asymptomatic. There are many variants of partial anomalous venous return, with anomalous return limited to a segment, lobe, or lung. The degree of impairment will vary with the extent of abnormal flow. Depending on the type and location of venous return, surgical correction may be possible.

Takayasu disease is an uncommon idiopathic inflammatory arteritis that causes fibrous thickening of the aortic arch with narrowing or obliteration of the origins of the great vessels [17]. The disease most often affects young women. Pulseless disease is sometimes used as a synonym, but many other diseases may affect arterial pulses similarly, including atherosclerosis, trauma, arterial embolus, and aortic coarctation [18]. Steroid therapy induces remission in approximately 60% of patients with Takayasu arteritis [19].

CT is not advocated as the diagnostic study of choice for either anomalous pulmonary venous return or Takayasu arteritis. However, these entities may not be suspected on initial evaluation, and

patients may be referred to CT for other presumed pathologies. The relatively asymptomatic patient with anomalous venous return may be evaluated primarily because of an abnormal chest radiograph [Fig. 1(a)] showing a mediastinal mass. In Patient No. 1, the widened mediastinum was clearly shown by CT to be caused by enhanced vascular structures representing the left vertical vein and massively enlarged superior vena cava [Fig. 1(c)]. With this type of anomalous return, anatomic criteria alone are probably sufficient for accurate diagnosis. When the anomalous vein is not as obvious, dynamic scanning at the plane of the right atrium during and after a bolus of intravenous contrast may demonstrate rapid recirculation of contrast via the left-to-right shunt, providing physiologic evidence of anomalous flow. Rapid recirculation would be expected with any left-to-right shunt, so that a specific diagnosis could not be reached in this setting.

Patients with Takayasu arteritis may present with nonspecific symptoms of fever and chest pain, or may demonstrate physical findings of diminished pulses. CT may be performed to exclude a mediastinal inflammatory process or, as in Patient No. 2, an occult mass compressing the great vessels. Bolus dynamic CT at a single plane where several arterial structures are present can provide data suggesting the presence of relatively diminished arterial flow in the affected vessel. Furthermore, the lack of extrinsic mass should point toward intrinsic arterial disease as a likely etiology. CT cannot distinguish Takayasu arteritis from other intrinsic arterial diseases (embolus, trauma, atherosclerosis). In the past, aortography would have been required for further evaluation of the arterial disease [19], but digital subtraction angiography is currently a noninvasive alternative [Fig. 2(c)].

In conclusion, the CT appearances of supracardiac anomalous pulmonary venous return and Takayasu arteritis are demonstrated. Contrast-enhanced dynamic scanning at a single tomographic plane is essential for evaluating the relatively diminished blood flow in the affected vessel in Takayasu arteritis and is useful in clarifying vascular anatomy in anomalous pulmonary venous return. CT is not the preferred diagnostic modality for either entity, but may prove definitive in some patients. In others, CT may narrow the differential diagnosis, expediting the subsequent work-up.

SUMMARY

The previously unreported CT findings in 2 unusual mediastinal vascular abnormalities, anomalous pulmonary venous return and Takayasu arteritis, are presented. CT is not the diagnostic study of choice for either entity, but may expedite the work-up in patients with clinically unsuspected anomalous venous return or Takayasu arteritis.

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