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Coronary CT Angiography in Takayasu Arteritis

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OBJECTIVES The aim of this study was to use coronary computed tomographic (CT) angiography to characterize coronary artery involvement in patients with known Takayasu arteritis who present with anginal chest pain or shortness of breath.

BACKGROUND Takayasu arteritis is a primary vasculitis of the large vessels, which mainly affects the aorta and its branches but can also involve the coronary arteries. Coronary CT angiography allows visualization of the coronary vessels and can be used to detect both stenotic and nonstenotic coronary artery lesions.

METHODS Eighteen consecutive patients with Takayasu arteritis and angina (typical or atypical) and/or dyspnea underwent contrast-enhanced 64-slice coronary CT angiography. The arterial injury was classified according to the Numano classification. Three patients had prior known coronary artery disease. Coronary arteries were evaluated concerning the presence of obstructive and nonobstructive lesions, and differences between the clinical presentations of patients with and without coronary artery involvement on CT angiography were analyzed.

RESULTS Coronary artery involvement was found in 8 patients (44.4%), 3 of them with clinical activity. A total of 19 coronary lesions were present (13 in ostial locations, 5 in proximal coronary artery segments, and 1 in a mid segment). Eight lesions exceeded 50% diameter reduction (2 in ostial locations and 6 in proximal coronary artery segments). Median disease duration was significantly different between patients with coronary artery involvement (176 months; range 13 to 282 months) compared with those without (21 months; range 1 to 142 months) ($p = 0.013$).

CONCLUSIONS Coronary CT angiography allows the assessment of coronary artery involvement in patients with Takayasu arteritis. These data confirm prior observations that most coronary lesions are in ostial or proximal coronary artery locations. Disease duration in patients with coronary artery involvement is longer than in patients without. (J Am Coll Cardiol Img 2011;4:958–66) © 2011 by the American College of Cardiology Foundation

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Takayasu arteritis (TA) is a primary large vessel vasculitis of unknown origin that mainly affects the aorta and its branches. It occurs worldwide and is more common in young women (median age at onset is 25 years). The incidence of TA in the United States is approximately 2.6 per 1 million persons, but it can be substantially different in other parts of the world (1–3). Both aneurysms and, more frequently, stenoses of the large vessels can occur. Up to 80% of patients present with hypertension, claudication is frequent, and in as many as 53% of patients, myocardial perfusion abnormalities were observed on Thallium-^{201} stress scintigraphy (4). In patient series with TA, between 7% and 29% of patients were found to have coronary involvement. In the vast majority of cases, the coronary ostial and proximal segments were affected (4–7). One series reported that 87.5% of hemodynamically relevant coronary artery stenoses were in ostial locations (7).

Invasive coronary angiography is the clinical gold standard for the diagnosis of coronary artery stenoses. However, it is not free of complications, arterial access can be difficult in patients with TA, and it may fail to visualize early atherosclerotic changes of the coronary arteries (8). Because of rapid technical developments in recent years, multidetector computed tomography (MDCT) has developed into a clinically useful method for coronary artery visualization in selected patients (9–11). Accuracy for stenoses detection is high if image quality is good (12–15), and because of its high negative predictive value, coronary computed tomographic (CT) angiography is most frequently used to exclude significant coronary stenoses (10,11). Coronary angiography using MDCT can be used to identify, and to a certain extent characterize, coronary atherosclerotic plaque (16–21). Furthermore, MDCT is a reliable tool for the diagnosis and severity assessment of aorto-ostial lesions (22,23).

The objective of this work was to systematically analyze coronary CT angiographic findings in a group of patients with TA who presented with angina symptoms or dyspnea to identify and describe patterns of coronary artery involvement.

METHODS

Study population. Among a cohort of 80 patients with TA, we included 18 consecutive patients who presented with dyspnea or angina (typical or atypical) between March 2006 and April 2009. The patients were sent to MDCT coronary angiography to rule out coronary involvement as a cause of symptoms, because coronary involvement in TA is mainly ostial and MDCT has been demonstrated to be useful in the diagnosis of this kind of lesion (22,23).

Inclusion criteria were established diagnosis of TA according to the American College of Rheumatology (at least 3 of the following criteria: age ≤40 years at disease onset, claudication of extremities, decreased brachial artery pressure, blood pressure difference >10 mm Hg between the arms, bruit over the subclavian arteries or aorta, and abnormal arteriographic results) (24) and angina and/or dyspnea. We classified patients according to the Numano classification into 6 types (Fig. 1) (25).

Typical angina was considered present if patients reported: 1) pre-cordial chest pain or discomfort that was; 2) caused by exertion or emotional stress; and was 3) relieved by rest and/or nitroglycerin. Atypical angina was defined if the patient had chest pain or discomfort, lacking 1 of the characteristics of typical angina (26). Exclusion criteria were creatinine >1.5 mg/dl, hemodynamic instability, iodine allergy, and pregnancy. All patients received information about the purpose and objectives of the study and provided written informed consent.

ABBREVIATIONS AND ACRONYMS

CT = computed tomographic

MDCT = multidetector computed tomography

TA = Takayasu arteritis

Disease activity was evaluated according to the criteria of Dabague and Reyes (27), including clinical findings, blood counts, erythrocyte sedimentation rate, C-reactive protein level, and fibrinogen level (Table 1). Patients were considered to have active disease if they reached 5 or more points.

Coronary CT angiography. PATIENT PREPARATION. Patients with heart rates more than 65 beats/min received oral atenolol (50 to 100 mg) 1 h before coronary CT angiography, in the absence of contraindications. If a heart rate between 50 and 60 beats/min was not achieved, repeated doses of 5 mg intravenous metoprolol were given every 5 min up to a maximal dose of 15 mg or until the expected heart rate was obtained. Sublingual nitroglycerin (5 mg) was given immediately before image acquisition.

PROTOCOL. CT data were acquired using a 64-slice CT scanner (Somatom Sensation 64; Siemens Medical Solutions, Erlangen, Germany). Scan parameters were set as follows: collimation 2 × 32 × 0.6 mm, gantry rotation time 330 ms, tube current 700 mA with electrocardiography-based tube current modulation, and tube voltage 100 to 120 kV. The scan length extended from the carina to the