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Follow-up with computed tomography after spontaneous isolated dissection of the splanchnic artery

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ABSTRACT

The aim of this study was to evaluate radiological changes after spontaneous isolated dissection of the superior mesenteric artery (SIDSMA) and spontaneous isolated dissection of the celiac artery (SIDCA) using computed tomography (CT). This single-center retrospective study was approved by the hospital institutional review board. We reviewed the medical records and morphological CT findings of 33 consecutive patients with SIDSMA or SIDCA who were diagnosed between January 2001 and February 2016. We analyzed changes on follow-up CT images including length of the dissection, presence of a thrombus in the false lumen, maximal outer diameter, degree of luminal stenosis, patency of distal flow, and end-organ injury. We classified short-term (within the first week) and long-term (between the first week and sixth month) follow-up groups and analyzed differences in radiological changes over time using Wilcoxon signed-rank tests (continuous variables) and Fisher exact probability tests (categorical variables). Additionally, we examined patients who completed follow-up CT within 3 days after symptomatic changes. Comparing initial and final CT findings, a majority of patients with SIDSMA and SIDCA showed no significant changes in most CT parameters, including dissection length, thrombus presence, dissection diameter, stenosis degree, and extended distal branch. Between the short-term and long-term CT follow-up groups, there were no significant differences in radiological changes except for in the degree of luminal stenosis at the dissected segment in SIDSMA ($P = 0.043$). Only 10 patients completed follow-up CT within 3 days after symptomatic changes (progression or regression); of these, 1 patient had radiological findings that matched symptom progression, showing an increase in the degree of luminal stenosis and end-organ injury. There was no splanchnic artery dissection-related mortality, symptom progression, or event recurrence. In conclusion, CT follow-up of SIDSMA and SIDCA was mainly useful in the acute phase of dissection, with no significant radiological changes occurring in the long term. Accordingly, we question the utility of long-term follow-up CT after spontaneous isolated arterial dissection, especially in the absence of symptom progression.

1. Introduction

Arterial dissection refers to disruption of the intima and blood extravasation between the two elastic layers of the vessel, and can be caused by a number of factors resulting in weakening of the vessel wall. Isolated arterial dissection without aortic dissection is relatively rare [1]. Since the first description of spontaneous isolated dissection of the superior mesenteric artery (SIDSMA) by Bauerfeld in 1947, there has been substantial research on SIDSMA and spontaneous isolated dissection of the celiac artery (SIDCA). Yet, despite decades of research, treatment guidelines and follow-up radiological study protocols are still debated [2].

The natural course of spontaneous isolated arterial dissection generally has limited progression with thrombosis of the false lumen; however, rupture through the adventitia or rapid expansion of the false lumen can occur, resulting in obliteration of the true lumen as well as further ischemic injury of the end organ [3]. Based on this rationale, traditional management strategies have included constructive treatment such as surgical or interventional management with short-term imaging follow-up. The current trend is primary observation and pharmacotherapy with anticoagulants and antiplatelet medications [4,5]. Endovascular stenting or surgery is only considered in patients with clinical progression or end-organ injury. One study found no significant changes in patients after isolated arterial dissection with long-term follow-up [6]. Yet, no specialized study to date has evaluated radiological changes during the natural course of spontaneous isolated

Abbreviations: MDCT, multiple detector computed tomography; SIDCA, spontaneous isolated dissection of the celiac artery; SIDSMA, spontaneous isolated dissection of the superior mesenteric artery

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splanchnic arterial dissection, and to this end there is no consensus regarding the optimal follow-up protocol. Accordingly, the aim of this study was to evaluate radiological changes on follow-up CT in patients with SIDSMA or SIDCA.

2. Material and methods

2.1. Ethics

This study was designed as a retrospective review of medical records and was approved by the hospital institutional review board.

2.2. Patient demographics

We retrospectively enrolled patients with SIDSMA or SIDCA who were treated at our center between January 2001 and February 2016. We used the following key diagnostic terms to search our institutional database: “artery dissection,” “SMA dissection,” “celiac dissection,” “SMA thrombus,” and “celiac thrombus.” We performed a chart review and retrospective imaging analysis of eligible patients and identified 51 patients. Two experienced radiologists with 25 and 3 years of experience reviewed the CT images and reached a consensus to diagnosis. A diagnosis of SIDSMA or SIDCA was made based on characteristic computed tomography (CT) findings and clinical findings with unexplained acute abdominal symptoms.

The inclusion criteria for patient enrollment were as follows: isolated splanchnic arterial dissection, unexplained symptoms, available electronic medical records, with two or more follow-up CT studies. We excluded patients who had trauma history, (N = 2, SMA dissection (SMAD); 1, CA dissection (CAD); 1), patients who showed dissection in both SMA and CA, (N = 1), asymptomatic patients, (N = 6, SMAD; 5, CAD; 1), and patients with a single CT study (N = 9, SMAD: 5, CAD; 4). A total 23 symptomatic patients with SIDSMA and 10 symptomatic patients with SIDCA had available electronic medical records with two or more follow-up CT studies and were ultimately included. This is organized in Fig. 1, as a flowchart.

We collected basic demographic information including age, sex, underlying disease such as hypertension or diabetes mellitus, and risk factors, such as smoking or pregnancy, for spontaneous arterial dissection. Clinical characteristics including pain severity and location, treatment modalities, admission duration, duration of symptom relief after the initial CT study, and long-term outcome were also recorded.

2.3. CT protocols

CT was performed with either a 320-channel multiple detector CT machine (Aquilion One, Toshiba, Tokyo, Japan), or a 64-channel multiple detector CT machine (Aquilion). Either Iohexol (IO-Brix, Taejoon Pharm, Seoul, Korea) or Iopamidol (Iopamigita 150, AGFAhealthCar, Melsungen, Germany) was used as contrast media. The detector thickness ranged from 1 to 3 mm. The standard contrast media infusion protocol was 100–120 ml with target infusion rates of 3–5 ml/s. Arterial phase images were taken when the descending aorta was estimated as 180 HU, and venous phase images were taken 180 s after arterial phase images. Our institute routinely performs axial and coronal multiplanar reconstruction, and we additionally reconstructed sagittal images for this study.

2.4. Initial CT imaging analysis

Diagnoses of SIDSMA and SIDCA were based on CT findings without other supplementary studies by identifying the intimal flap or thrombosis of the false lumen of the SMA or CA on contrast-enhanced CT images [3]. After diagnosis, 8 radiological features of dissection were evaluated as tangentially to the vessel as possible on magnified initial CT images. The distance from the splanchnic artery (either the celiac or superior mesentery artery) orifice to the dissection entry was determined. The length of the dissection, presence of a thrombus in the false lumen, and maximal outer diameter of the dissected arterial segment were measured. The degree of luminal stenosis at the dissected segment of the dissected artery was measured using the outer diameter and the diameter of the true lumen at the site of maximal stenosis between the splanchnic artery origin and the branching arteries origin as per the following equation: percent stenosis = (1 − [maximal stenotic diameter]/[unaffected SMA or CA orifice diameter]) [7]. The absence of distal flow and end-organ injury were determined by the consensus of 2 radiologists. End-organ injury included bowel ischemia and infarction, which were considered to be present when mesenteric ischemic signs, such as poor bowel wall enhancement, wall thickening with or without distended loops, and intramural air densities or ascites,

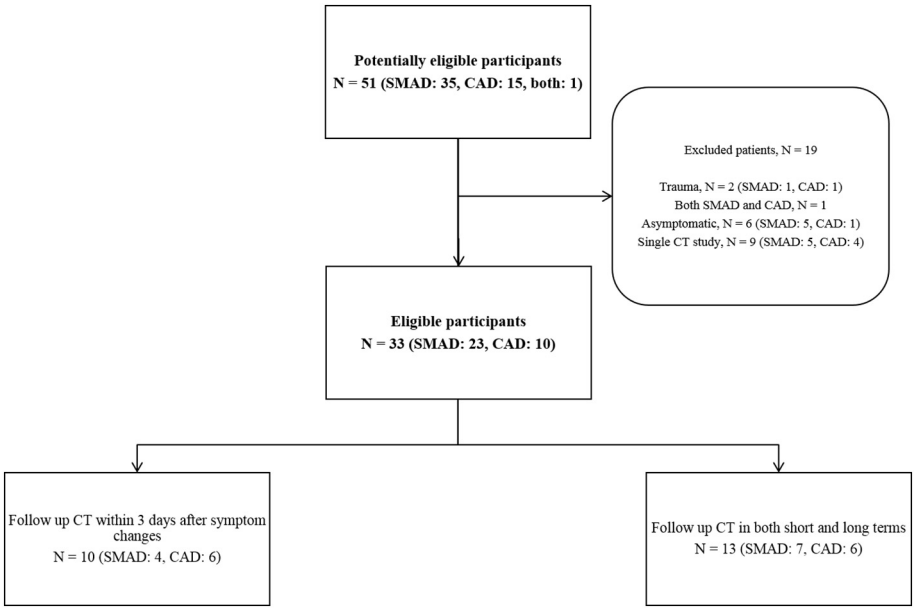

Fig. 1. Flowchart depicting patient selection and study design.
SMAD: superior mesenteric artery dissection, CAD: celiac artery dissection, CT: computed tomography.