

症例報告

Isolated Spontaneous Dissection of the Splanchnic Arteries in the Era of Multidetector Computed Tomography

Yoshimi Sato, MD; Tatsuya Kawasaki, MD, PhD; Tomoya Kotani, MD*; Sakiko Honda, MD;
Kuniyasu Harimoto, MD; Shigeyuki Miki, MD, PhD; Yo Ushijima, MD, PhD*;
Tadaaki Kamitani, MD, PhD

Department of Cardiology, Matsushita Memorial Hospital

*Department of Radiology, Matsushita Memorial Hospital, Osaka, Japan

ABSTRACT: Isolated spontaneous dissection of the splanchnic arteries is defined as a splanchnic dissection that occurs in the absence of an aortic dissection and is considered to be extremely rare. However, it has been suggested that the development of advanced imaging technologies, such as multidetector computed tomography (CT), has resulted in an increased number of cases of isolated spontaneous dissection of the splanchnic arteries being detected. This study examined 6,072 consecutive patients who underwent abdominal multidetector CT scans between April 2013 and March 2014 at Matsushita Memorial Hospital (2,969 non-contrast-enhanced scans medium and 3,103 contrast-enhanced scans; 3,764 planned scans and 2,308 scans performed in an emergency setting). The incidence, clinical characteristics, and outcomes of isolated spontaneous dissection of the splanchnic arteries were examined retrospectively. A total of five patients were diagnosed with isolated spontaneous dissection of the splanchnic arteries, resulting in incidence rates of one per 1,214 abdominal CT scans and one per 462 emergency abdominal CT scans. The mean age of the five patients was 53 years. Four of the patients were men, three of whom were current smokers; four patients had hypertension; and one patient had dyslipidemia. None of the patients had diabetes. Four of the patients presented with acute abdominal pain. The patients' clinical courses were uneventful, and invasive treatment was not required in any case. Isolated spontaneous dissection of the splanchnic arteries is unlikely to be extremely rare, especially among middle-aged male smokers who have a history of hypertension and present with acute abdominal pain.

Keywords; Computed tomography, dissection, multidetector, splanchnic artery

Introduction

Isolated spontaneous dissection of the splanchnic arteries is defined as dissection of an abdominal splanchnic artery in the absence of an aortic

dissection and is considered to be extremely rare^{1,2)}. However, it has been suggested that the development of advanced imaging technologies, such as multidetector computed tomography (CT), has resulted in an increased number of cases of isolated spontaneous dissection of the splanchnic arteries being detected^{3,4)}. The objectives of the present study were to examine the incidence, clinical characteristics, and outcomes

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連絡先：〒570-8540

大阪府守口市外島町5番55号

松下記念病院

循環器内科(佐藤良美)

of isolated spontaneous dissection of the splanchnic arteries in the era of multidetector CT.

Methods

This retrospective study examined consecutive patients who underwent abdominal multidetector CT scans between April 2013 and March 2014 at Matsushita Memorial Hospital. Isolated spontaneous dissection of the splanchnic arteries was defined as a focal dissection in the absence of an aortic dissection that was detected on CT and diagnosed by two or more physicians including a radiologist and a cardiologist. Disagreements were resolved by consensus. Basically non-contrast-enhanced CT scans were obtained using a 16-row CT scanner (BrightSpeed Elite Pro Vision, GE Healthcare Japan, Tokyo), and contrast-enhanced CT scans were acquired using a 64-row CT scanner (LightSpeed VCT, GE Healthcare Japan, Tokyo). When a CT scan was performed on the same day that it was ordered, it was classified as an emergency CT scan. During the 12-month study period, abdominal multidetector CT scans were performed in 6,526 cases. Of these, 401 cases were excluded because the scan results were not examined by a radiologist, and 53 were excluded because the images were limited to the lower abdomen. As a result, 6,072 cases were included in this study (2,969 non-contrast-enhanced scans and 3,103 contrast-enhanced scans; 3,764 scans were planned and 2,308

were performed in an emergency setting).

Hypertension was defined as the use of antihypertensive drugs, a systolic blood pressure of >140 mmHg, or a diastolic blood pressure of >90 mmHg. Diabetes mellitus was defined as the use of oral antihyperglycemic agents or insulin, a fasting glucose of >126 mg/dl, a non-fasting glucose level of >200 mg/dl, or a glycated hemoglobin value of $\geq 6.5\%$. Dyslipidemia was defined as a low-density lipoprotein cholesterol level of ≥ 140 mg/dl, a high-density lipoprotein cholesterol level of <40 mg/dl, a triacylglycerol level of ≥ 150 mg/dl, or a history of treatment with lipid-lowering drugs.

Results

A total of five patients were diagnosed with isolated spontaneous dissection of the splanchnic arteries (Table 1). The incidence of isolated spontaneous dissection of the splanchnic arteries was estimated to be one per 1,214 abdominal CT scans and one per 462 emergency abdominal CT scans. The mean age of the five patients was 53 years old (range: 39 to 68), and four patients were men. Of the four male patients, three were current smokers. In addition, four patients had hypertension, and one had dyslipidemia. None of the patients had diabetes. Four of the patients were diagnosed with isolated spontaneous dissection of the splanchnic arteries after CT scans performed due to acute abdominal pain, whereas

Table 1 Clinical characteristics

	Age (years)	Male sex	Height (m)	Weight (kg)	Body mass index (kg/m ²)	Current smoker	Hypertension	Dyslipidemia	Diabetes mellitus
Case 1	56	Yes	1.83	82	24.5	Yes	Yes	No	No
Case 2	68	No	NA	40	NA	No	Yes	Yes	No
Case 3	52	Yes	1.79	75	23.4	No	No	No	No
Case 4	48	Yes	1.75	80	26.1	Yes	Yes	No	No
Case 5	39	Yes	1.67	97	34.8	Yes	Yes	No	No
All	53 ± 10	4 (80%)	1.76 ± 0.06	75 ± 19	24.5 ± 4.5	3 (60%)	4 (80%)	1 (20%)	0

Data are shown as mean ± standard deviation values or number (percentage). Body mass index is the weight in kilograms divided by the square of the height in meters. NA denotes not available.

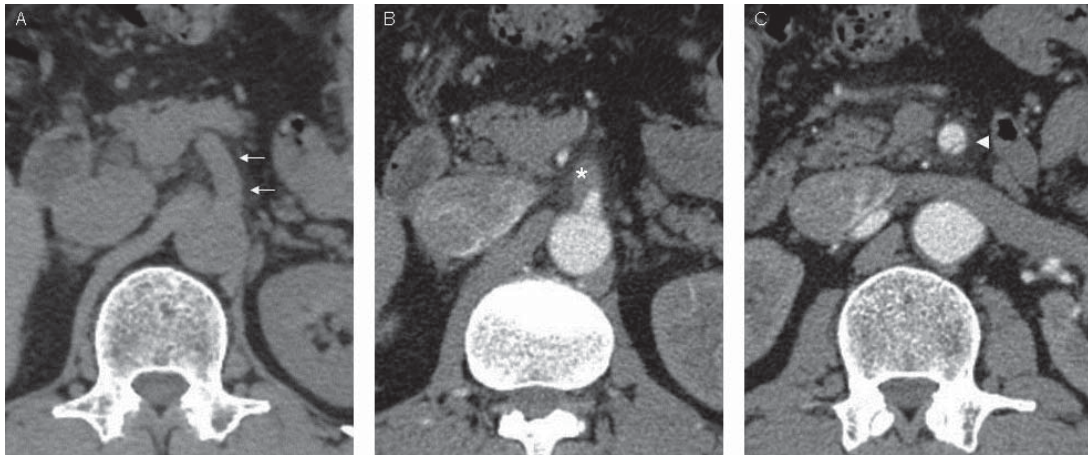


Figure 1. CT images of the abdomen

A non-contrast-enhanced CT scan showing that the root of the superior mesenteric artery was dilated (A, arrows). After the administration of contrast medium, dissections of the superior mesenteric artery (B, asterisk) and one of its branches (C, arrowhead) were detected.

the diagnosis was made by chance in one patient. The final diagnosis was confirmed on contrast-enhanced CT scans in all five patients, although two of them were suspected to have isolated spontaneous dissection of the splanchnic arteries because expansion of the celiac arteries was detected on non-contrast-enhanced CT scans.

Case 1

A 56-year-old man with a history of hypertension experienced sudden-onset upper abdominal pain before lunch. Upper gastrointestinal endoscopy and abdominal ultrasonography did not provide any useful diagnostic information. Five days later, the patient returned to our hospital as his upper abdominal pain had not resolved and had moved to the lower left side of his abdomen. A non-contrast-enhanced abdominal CT scan showed that the root of the superior mesenteric artery was dilated (Figure 1A). A diagnosis of dissections of the superior mesenteric artery and one of its branches was made on a subsequent contrast-enhanced CT scan (Figures 1B and 1C), and three-dimensional reconstruction of the CT images suggested that good distal perfusion was maintained (Figure 2). The patient was conservatively treated with bisoprolol, nifedipine, and

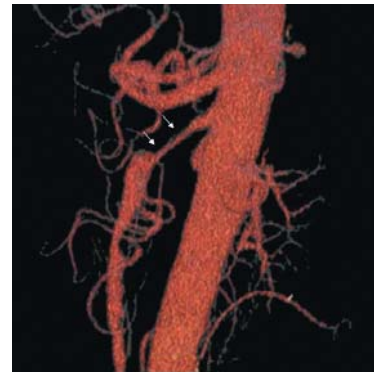


Figure 2. Three-dimensional reconstruction of CT images

CT image showing that the basal part of the mesenteric artery (arrows) had narrowed; however, good distal perfusion is maintained.

atorvastatin. His clinical course was uneventful, and he has been doing well and has not experienced any recurrence of his symptoms for more than two years.

Case 2

A 68-year-old woman developed sudden-onset umbilical pain immediately after she woke up. The pain improved, but then recurred four days later. The patient was referred to the emergency department of our hospital. Neither abdominal ultrasonography nor a blood examination was informative. A contrast-enhanced CT scan showed a focal dissection of the celiac ar-

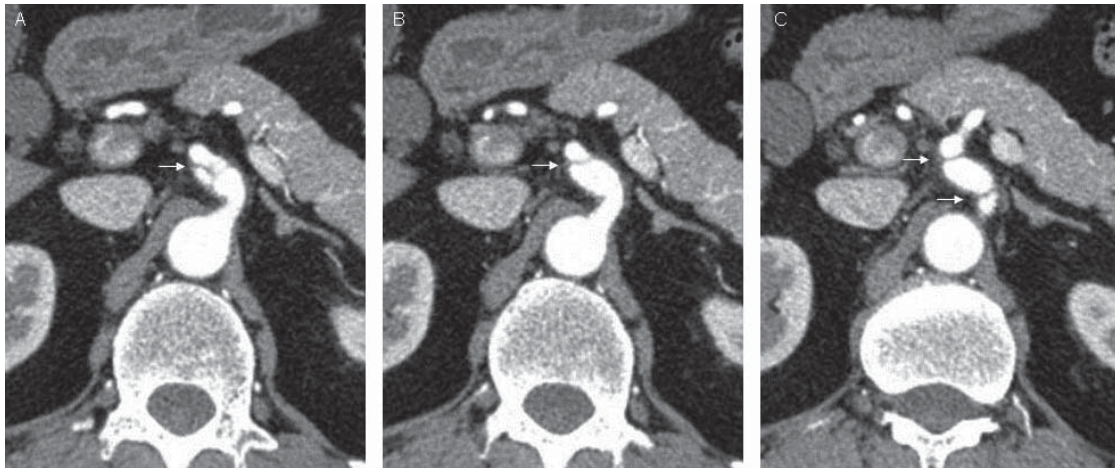


Figure 3. Contrast-enhanced CT images

A series of CT images (A, top; B, middle; C, bottom) clearly showing the focal dilatation and dissection of the celiac artery (arrows).

tery. The patient's symptoms gradually improved after fasting and blood pressure control and finally disappeared several days after her admission. The patient returned to her physician and was treated with antihypertensive drugs. Her subsequent clinical course was uneventful.

Case 3

An otherwise healthy 52-year-old man was referred to our hospital after a suspected hepatic hemangioma was detected on ultrasonography during a health checkup. A contrast-enhanced abdominal CT scan showed the focal expansion and dissection of the celiac artery (Figure 3). The patient did not receive any medication. Careful history taking, e.g., about any abdominal pain or trauma, was performed, but the onset time of the isolated dissection of the celiac artery could not be determined. The patient was lost to follow-up.

Case 4

A 48-year-old man visited another hospital due to the sudden onset of abdominal and back pain. Blood examinations and abdominal ultrasonography produced normal findings. Four days later, the patient presented to our hospital because his symptoms had not disappeared. A con-

trast-enhanced CT scan was performed to rule out thromboembolism because he had had a history of paroxysmal atrial fibrillation. The patient was finally diagnosed with dissection of the upper superior artery. He was transferred to another hospital to be considered for surgery, but his symptoms resolved without invasive treatment a few days later. Antihypertensive drugs were withdrawn because of the normalization of the patient's blood pressure, and he has not suffered a relapse for more than one year.

Case 5

A 39-year-old man, who was diagnosed with fecal impaction at another hospital, presented to our hospital with abdominal pain. A non-contrast-enhanced abdominal CT showed the expansion of the main celiac artery and the superior mesenteric artery and an increased amount of fatty tissue. A diagnosis of dissection of the main trunk of the celiac artery and focal dissection of the superior mesenteric artery was made on a subsequent contrast-enhanced CT scan. Stenosis of the common hepatic and splenic arteries, which had resulted in partial thrombotic occlusion, was also detected. The patient was transferred to another hospital to be considered for surgical treatment, but it was subsequently

decided that he should be treated conservatively. The patient has been doing well and has been receiving antihypertensive therapy involving carvedilol, valsartan, and nifedipine for more than one year.

Discussion

A diagnosis of isolated spontaneous dissection of the splanchnic arteries was made in five cases during a one-year period at our hospital. Four of the patients were diagnosed after developing acute abdominal pain, but in the remaining case the dissection was detected incidentally during an examination for another disease. Isolated spontaneous dissection of the splanchnic arteries is likely to be associated with a history of hypertension and smoking, but not with dyslipidemia or diabetes. The clinical courses of all five patients, all of whom were treated conservatively, were uneventful.

Few data are available about the incidence of isolated spontaneous dissection of the splanchnic arteries. In the present study, which was based on the use of multidetector CT, the incidence of isolated spontaneous dissection of the splanchnic arteries was one in every 1,214 abdominal imaging scans and one in every 462 emergency abdominal imaging scans. Given the fact that 48.9% of the abdominal CT scans performed in our cohort were non-contrast-enhanced scans, we cannot rule out the possibility of underdiagnosis since arterial dissections are difficult to diagnose on such scans. Our findings suggest that isolated spontaneous dissection of the splanchnic arteries should be considered among patients who develop acute abdominal pain and have a history of hypertension and smoking (i.e., we recommend the use of contrast-enhanced CT in such cases). It should also be noted that once we had successfully diagnosed one case of isolated spontaneous dissection of the splanchnic arteries using multidetector CT, we subsequently diagnosed two further cases of the condition within a short pe-

riod of time.

The sites of the splanchnic artery dissections in our five cases included the celiac arteries in two cases, the superior mesenteric arteries in two cases, and both the celiac and superior mesenteric arteries in one case. Previous studies have shown that about 80% of patients with isolated spontaneous dissection of the splanchnic arteries suffer a dissection in the superior mesenteric artery^{3,4}. In our cohort, four of the five patients developed acute abdominal pain, but the remaining patient was asymptomatic. It is well known that the initial symptoms of a splanchnic artery dissection include acute abdominal pain, back pain, and vomiting⁴, but asymptomatic cases do not seem to be rare⁵. This could also lead to the incidence of the condition being underestimated, since asymptomatic patients rarely seek medical help. Multicenter studies should be performed to assess the incidence of isolated spontaneous dissection of the splanchnic arteries and the clinical characteristics of patients with the condition in more detail.

Isolated spontaneous dissection of the splanchnic arteries can be treated using conservative, intravascular, or surgical treatment³, although appropriate guidelines have not been available yet. In a previous study of 172 cases of isolated spontaneous dissection of the splanchnic arteries by Suzuki et al.⁴, 128 (74.4%) patients were treated conservatively, 12 (7.0%) patients were treated intravascularly, and 32 (18.6%) patients were treated surgically. Of these patients, three (1.7%) died during the acute phase of their dissections, and the survival rate at 20.6 months was 98.3%, indicating that dissection of the splanchnic arteries exhibits a good prognosis in the chronic phase. The clinical courses of our five patients were uneventful, even though they all received conservative treatment. Anticoagulant treatment, followed by invasive procedures, might be considered when progressive ischemia develops in the organs, although convincing evidence for the efficacy of this approach is lacking^{4,6}.

The proposed causes of isolated spontaneous dissection of the splanchnic arteries include arteriosclerosis, fibromuscular dysplasia, vasculitis, trauma, congenital tissue disease, segmental arterial mediolysis, and infection⁴⁾. None of our five patients exhibited features that were indicative of vasculitis, trauma, congenital connective tissue disease, segmental arterial mediolysis, or infection. Given the ages of our patients, arteriosclerosis was the most likely cause of their dissections, although fibromuscular dysplasia cannot be completely ruled out since histopathological examinations were not performed.

The present study has some limitations. Our results may not be extrapolated to all patients that suffer isolated spontaneous dissection of the splanchnic arteries because our study was retrospective and was conducted at a single center. In addition, all five patients with isolated spontaneous dissection of the splanchnic arteries were diagnosed using 16-row or 64-row multidetector CT; however, the superiority of multidetector CT over single detector CT or that of 64-row CT over 16-row CT has not been determined. Further studies are needed to clarify these issues.

In conclusion, isolated spontaneous dissection of the splanchnic arteries is unlikely to be extremely rare, especially among middle-aged male smokers who have a history of hypertension and present with acute abdominal pain.

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多列検出器コンピュータ時代の孤立性腹部内臓動脈解離

佐藤良美, 川崎達也, 小谷知也*, 本田早潔子, 張本邦泰, 三木茂行, 牛嶋 陽*, 神谷匡昭

松下記念病院 循環器内科

*松下記念病院 放射線科

孤立性腹部内臓動脈解離は大動脈解離を伴わない腹部内臓動脈解離と定義され, 従来は極めて稀な病態と考えられていた. しかし, 多列検出器コンピュータ断層撮影(computed tomography, CT)などの画像技術の進歩に伴い, 孤立性腹部内臓動脈解離と診断される症例は増加していることが推察される. そこで本研究では, 多列検出器CT時代における孤立性腹部内臓動脈解離の頻度とその臨床的特徴を後ろ向きに調査した. 2013年4月1日から2014年3月31日の間に当院で施行した腹部の多列検出器CT連続症例6,072件(単純検査2,969件, 造影検査3,103件/緊急検査2,308件, 予定検査3,764件)のうち, 孤立性腹部内臓動脈解離と診断された症例は5例で, 腹部CT検査の1,214件に1件, 緊急腹部CTの462件に1件の割合であった. 5例の平均年齢は53歳で, 4例が男性, その内3例が喫煙者であった. 合併疾患は高血圧4例, 肥満2例, 脂質異常1例で, 糖尿病を有する症例はなかった. 他疾患の検査中に偶然診断された1例を除き, すべて急性腹症として発症していた. 臨床経過は良好であり, 経過中に侵襲的治療を要した症例はなかった. 高血圧歴と喫煙歴を有する中年男性の急性腹症では, 孤立性腹部内臓動脈解離は稀ではないことが示唆された.

キーワード: 解離, 多列検出器, 腹部内臓動脈, CT