Ann Vasc Dis Vol. 12, No. 4; 2019; pp 456–459

Online August 26, 2019
doi: 10.3400/avd.oa.19-00082

Original Article

Long-Term Outcomes of Spontaneous Isolated Superior Mesenteric Artery Dissection

Hirono Satokawa, MD, PhD, Shinya Takase, MD, PhD, Hiroki Wakamatsu, MD, PhD, Yuki Seto, MD, PhD, Hiroyuki Kurosawa, MD, PhD, Akihiro Yamamoto, MD, PhD, Tsuyoshi Fujimiya, MD, PhD, Keiichi Ishida, MD, and Hitoshi Yokoyama, MD, PhD

Spontaneous isolated dissection of the superior mesenteric artery (SMAD) is not still well known. We retrospectively analyzed our 30 patients with SMAD to elucidate the treatment strategy and long-term follow-up outcomes. Due to severe abdominal symptom we performed a stents deployment and surgical reconstructive surgery for each one case. Anerysmectomy and bypass surgery was performed for a patient with aneurysmal change. Other 27 patients were managed conservatively. SMAD patients had only two vascular events (renal infarction and graft occlusion), and showed good prognosis for 6–146 (mean 69) months follow-up. We found that there is a few SMAD patients necessary of invasive management at acute phase and that most patients are safely conservatively treated with good prognosis. (This is a translation of J Jpn Coll Angiol 2018; 58: 195–199.)

Keywords: spontaneous isolated dissection of superior mesenteric artery, open surgery, conservative treatment, endovascular treatment

Introduction

Superior mesenteric artery dissection (SMAD) is the most common isolated dissection of the visceral arteries without aortic dissection and it has been previously regarded as a rare disease.[1] However, recent improvements in its diagnostic accuracy[2,3] have led to incidental diagnosis of patients with SMAD, and its acute-phase pathology has gradually been clarified. However, the long-term results and prognoses of isolated disease remain unclear. Our department has been treating patients with isolated disease for over 10 years. Therefore, we evaluated the long-term outcomes of treatment for isolated disease, along with a literature review.

Patient Population and Methods

Treatments for acute disease, treatment outcomes, complications, and long-term results were assessed in patients with SMAD who visited our department from February 2005 onward. SMAD was not associated with aortic dissection; hence, not only superior mesenteric artery but also other visceral artery dissections were included in this study.

The morphology after SMAD dissection was classified into Type I–VI based on the classification described by Sakamoto et al. and Zerbib et al. (**Fig. 1**).[3–5] The following items were evaluated: (1) the pathophysiology of and treatments for acute disease as well as treatment outcomes; (2) evaluation of the dissection morphology of isolated disease using contrast-enhanced computed tomography (CT) as well as the changes caused by dissection; and (3) retrospective chart review of long-term outcomes of isolated disease as well as the collection and review of data from other institutions.

Fig. 1 Modified Sakamoto's classification of spontaneous isolated superior mesenteric artery dissection.

Department of Cardiovascular Surgery, Fukushima Medical University, School of Medicine, Fukushima, Fukushima, Japan

Received: July 1, 2019; Accepted: July 1, 2019
Corresponding author: Hirono Satokawa, MD, PhD. Department of Cardiovascular Surgery, Fukushima Medical University, School of Medicine, 1 Hikarigaoka, Fukushima, Fukushima 960-1295, Japan
Tel: +81-24-547-1111, Fax: +81-024-548-3926
E-mail: satokawa@fmu.ac.jp
This is a translation of J Jpn Coll Angiol 2018; 58: 195–199.

Results

Acute stage disease

A total of 30 patients with SMAD visited our department, with age ranging from 39 to 75 (mean: 59) years, including 28 male (93%) and 2 female patients. Only one patient experienced the complication of splenic artery dissection. Background factors included smoking in 22 patients (73%), hypertension in 20 (67%), and diabetes mellitus in 2 (7%). Abdominal pain was noted in 16 (53%) patients and bloody stools in 3 (10%); in total, 14 (47%) patients were asymptomatic and were identified after CT and other examinations (**Table 1**).

When the SMAD morphology was evaluated based on contrast-enhanced CT and angiography, Type IV disease was noted in 11 patients (30%), Type I in 6 (20%), Type II in 5 (17%), and Type III in 5 (17%). Type V disease was observed in 1 patient (3%) and Type VI in 2 (7%). The 2 patients with Type VI disease complained of severe abdominal pain after the disease onset; one patient underwent urgent stenting using 10×60 mm and 6×100 mm SMART stents (Cordis, Tokyo, Japan); 5 months later, the other patient underwent thrombectomy with varicocelectomy and bypass with autologous veins owing to an aneurysm formed in the dissected segment. One patient with Type II disease underwent resection of a segment with aneurysm and a bypass with autologous veins owing to the enlargement of the dissected segment 3 months after the onset of Type II disease (**Table 2**).[5] Among the 13 patients with mild abdominal symptoms, follow-up was performed with fasting and fluid management, and 2 patients with Type I and 3 patients with Type IV disease were treated with aspirin-based antiplatelet therapy, with all patients experiencing improvement in their symptoms. Fourteen patients were asymptomatic and were only followed through observation.

Table 1 Clinical characteristics in patients with spontaneous isolated superior mesenteric artery dissection

Clinical features	(n=30)
Median age (range, years)	59.0 (39–75)
Gender, male (%)	28 (93)
Coexisting medical conditions	No. (%)
Smoking	22 (73)
Hypertension	20 (67)
Diabetes mellitus	2 (7)
Intra-abdominal cancer	0 (0)
Symptom	
Abdominal pain	16 (53)
Tarry stool	3 (10)
Asymptomatic	14 (47)

Morphology of dissection in isolated disease

The status of dissection in isolated disease was evaluated using contrast-enhanced CT in 27 patients after minimum 1 year of disease onset. Regarding invasive treatment, in one patient treated by stents 9 years had passed since the insertion of stents; however, the site of stent insertion was patent (**Fig. 2**). In 2 patients who underwent varicocelectomy and bypass with autologous veins, the bypass was patent in one patient, whereas graft occlusion was noted in other patient at 6-year follow-up. However, intestinal ischemic symptoms did not occur, and the progress was good.

When examining patients who received medical treatments, in 6 Type I patients the dissecting cavities were patent, and the morphology of Type I disease was maintained

Fig. 2 Stent deployment case.
(**A**) Preoperative CT (coronal section) showing the occluded superior mesenteric artery (black arrow), (**B**) preoparative CT (sagittal section), (**C**) CT at 9 years from stent deployment.

Table 2 Classification of the spontaneous isolated superior mesenteric artery dissection and treatment

Classification	Patients (%)	Treatment	
		Medicinal	Invasive
Type I	6 (20)	6 (2)*	0
Type II	5 (17)	4	Conservative→Aneurysmectomy and iliac-ileal bypass 1
Type III	5 (17)	5	0
Type IV	11 (30)	11 (3)*	0
Type V	1 (3)	1	0
Type VI	2 (7)	0	Stent deployment 1
			Thrombectomy & intimectomy→Aneurysmectomy and iliac-ileal a. bypass 1

*: patient who was prescribed aspirin.

Table 3 Morphological changes of spontaneous isolated superior mesenteric artery dissection patients and follow-up results

Classification	Patients no. (conservative)	Aneurysmal change	Remodeling*	Follow-up results	
Type I	6	0	0	Alive	6
Type II	4	0	1	Alive	4
Type III	5	0	4	Alive	5
Type IV	11	0	10	Alive	10
				Pneumonia	1
Type V	1	0	0	Alive	1

Remodeling: dissections disappeared completely.
Type II 1 patient and type VI 2 patients were performed invasive treatments, and were excluded from this table.

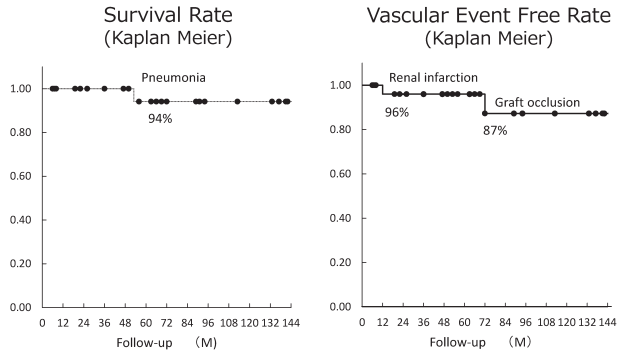

Fig. 3 Follow-up results of spontaneous isolated superior mesenteric artery dissection patients.

in all patients with isolated disease. None of the 6 patients with Type I disease had a superior mesenteric artery with a diameter 1.5 times larger than that in the peripheral part of the dissection. Among the 4 patients with Type II disease, the dissected segment remained patent in 3 patients; diameter expansion was not observed, and dissecting cavity disappearance was confirmed in 1 patient. Among the 5 patients with Type III disease, morphology remained the same in 1 patient; however, in the remaining 4 patients, the disappearance of ulcer-like projections was confirmed, and wall thickening also resolved. In 1 patient with Type IV disease, the morphology was maintained, whereas in the other 10 patients, the dissecting cavity disappeared. In 1 patient with Type V disease, the dissecting cavity was clotted and changed to Type IV. Overall, a total of 15 patients exhibited dissecting cavity disappearance without abnormalities in blood vessel wall (56%), and those who needed remodeling were mainly patients with Types II and III disease (**Table 3**).

Long-term results

Follow-up ranged from 6 months to 12 years and 2 months (mean: 5 years and 9 months), with a follow-up rate of 97%. Regarding survival prognosis, 1 patient died 4 years after the disease onset owing to pneumonia, and the rest of the patients are alive. In terms of vascular events 1 year after the onset, 1 patient with a bypass experienced graft occlusion, whereas 1 patient experienced renal infarction in the 1st year after onset (**Fig. 3**).

Discussion

As the number of patients with SMAD is increasing, the diagnosis of and treatment for acute disease are gradually becoming increasingly clear. Majority of patients with SMAD are males in their 50s,[6] and the disease often manifests as sudden abdominal pain.[5] In most patients, administration of conservative treatment results in symptom improvement; however, owing to the dissection of the superior mesenteric artery, in severe cases, there is a risk of intestinal ischemia and ruptures due to dissection.[2,7,8] In patients who visited our department, endovascular treatment was performed because of severe abdominal symptoms associated with acute disease and the possibility of intestinal ischemia in one patient, and surgical blood flow reconstruction was performed in one patient. Although ruptures are rare in acute SMAD,[9,10] some patients exhibit morphological changes in the dissection or enlargement of aneurysms over time; therefore, periodic observations are considered necessary after the onset of the disease.

Endovascular therapy followed by surgery is indicated in patients with severe symptoms of acute disease and in those with a risk of intestinal ischemia.[7,11] Endovascular treatment includes thrombolysis, thrombus aspiration, balloon dilation, stent insertion, and stent-graft placement,[5,12] which have been reported successfully; however, long-term results have not been clarified.[2] Several surgical methods have also been reported,[7,8,11,12] and their advantage is that direct diagnosis by laparotomy is feasible when intestinal ischemia is suspected during surgery.

Conservative treatment includes fasting, nutritional support, and blood pressure control as well as anticoagulation and antiplatelet therapy.[13] Anticoagulation therapy[14] is not effective in preventing the progression of dissection, and several patients have been reported to improve without it.[11,15] Many patients with SMAD were accidentally diagnosed via CT or as noted in this study, with unclear time of onset. Even in our study, 14 patients (47%) were asymptomatic and were diagnosed based on CT examinations. Although it was difficult to determine

the progression to acute disease based on the dissection morphology in these patients, many of them had a localized dissection site. In such patients, anticoagulation therapy is not necessary, and follow-up through observation is considered appropriate. In patients with mild SMAD, conservative treatment is chosen when true lumen blood flow is maintained.[16,17] Mizuno et al.[18] reported that there were a total of 221 patients in Japan, and only 12 of these patients underwent surgery (5.4%), and only 1 case of hospital death was confirmed during conservative treatment. In addition, Heo et al.[19] recommend that, if most of the 116 patients who received conservative treatment exhibited clinical improvement, this method should be used as the first-line therapy. Regarding the long-term course of SMAD in the literature, no patient had recurrent symptoms or died during a 53–57-month observation period, and the treatment course has been good,[19,20] with resolution or improvement in the dissection morphology as noted via CT and other methods in 63%–93% of patients. Even in patients in our department, the long-term prognosis from 6 months to 12 years and 2 months (mean: 5 years and 9 months) was good, and remodeling of the dissection morphology was recognized in 56% of patients.

Conclusion

The diagnosis of and treatments for patients with SMAD were evaluated. Invasive treatment was chosen for acute patients at risk for intestinal ischemia; however, conservative treatment could be selected in majority of patients. As the morphology of the dissecting cavity changes after the disease onset, periodic observation via CT and other methods is necessary. The dissecting cavity disappeared in several patients with good long-term prognosis.

Disclosure Statement

None of the authors have conflicts of interest to report.

Additional Remarks

The content of this report was presented at the 46th Annual Meeting of the Japanese Society for Vascular Surgery (held in Yamagata City, Japan in 2018).

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