Failures and Lessons in the Endovascular Treatment of Symptomatic Isolated Dissection of the Superior Mesenteric Artery

Zhihui Dong[1] *Junjie Ning*[1] *Weiguo Fu, Daqiao Guo, Xin Xu, Bin Chen, Junhao Jiang, and Yuqi Wang, Shanghai, China*

Background: To discuss failures and lessons in the endovascular treatment of symptomatic isolated dissection of the superior mesenteric artery (SIDSMA).
Methods: Data from 33 patients with SIDSMA treated between July 2007 and September 2013 were retrospectively collected. The technical failures in and lessons from endovascular management were analyzed in terms of causes and prophylaxis.
Results: Eighteen patients were successfully treated medically, 13 underwent stent placement, 1 underwent a hybrid procedure, and 1 had open fenestration. Full follow-ups (37 ± 21 months) were achieved in 28 patients. Failures to cannulate the true lumen occurred in 8 patients. Among these patients, femoral and brachial approaches were taken in 6 and 2 patients, respectively, and a 2-sided Fisher's exact test revealed no significant differences ($P = 0.204$). Among the 6 femoral failures, the true lumina were cannulated after conversion to the brachial approach in 3 cases. The perfusion of the distal SMA was not improved until the second stent was distally placed to cover the entire expanded false lumen in 1 case. Numerous branches originating from the false lumen were overlooked in 1 patient and were apparently compromised after stenting. Consequently, the patient died of intestinal necrosis. In a patient with a huge dissecting aneurysm, a stent was misplaced across the false lumen. Fortunately, a remarkable aneurysmal thrombosis formed at 3 months. In a patient who received a hybrid procedure, the stent was occluded at 2 weeks, most likely because the thrombus protruded into the stent.
Conclusions: Difficulty in cannulating the true lumen is not uncommon in the endovascular treatment of SIDSMA, and the selection of the arterial approach would benefit from being based on the morphology of the SMA arch. The lengths and branches of the involvement of the false lumen should be evaluated beforehand. Covered stents would be a reasonable option for lumina that contain thrombi.

Endovascular stenting has been reported to represent an important treatment modality for symptomatic isolated dissection of the superior mesenteric artery (SIDSMA).[1–3] Given that the incidence of isolated dissection of the superior mesenteric artery (SMA) is as low as 0.06%[4] and that a large proportion of such cases can be successfully medically treated,[1,5,6] reports related to failures in and lessons from the endovascular management of SIDSMA appear to be rather limited; however, such failures

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Department of Vascular Surgery, Zhongshan Hospital, Institute of Vascular Surgery, Fudan University, Shanghai, China.

[1] *These authors contributed equally to the work.*

Correspondence to: Zhihui Dong, MD or Weiguo Fu, MD, Department of Vascular Surgery, Zhongshan Hospital, Fudan University, Institute of Vascular Surgery, Fudan University, Shanghai 200032, China; E-mails: dzh926@126.com or fu.weiguo@zs-hospital.sh.cn

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can be associated with catastrophic complications, such as aggravation of the intestinal ischemia or even necrosis. To the best of our knowledge, no studies have yet focused on these issues. The current investigation sought to discuss these issues based on a retrospective analysis of 33 patients with SIDSMA.

METHODS

Data Collection and Analysis

Data from 33 patients with SIDSMA who were treated in our center between July 2007 and September 2013 were retrospectively collected and included age, gender, clinical manifestations, onset to admission duration, morphology of the SMA, treatment modalities, perioperative morbidity and mortality, arterial approach for the endovascular procedure (i.e., femoral and/or brachial), patency rate of the stents, and symptom-free survival rate. The technical failures in and lessons from the endovascular management were analyzed in terms of their causes and potential future preventative measures.

Classification of the SMA Arch

Given the relatively high technical failure rates in the cannulation of the true lumen and the introduction of the sheath that we have encountered and the well-recognized correlation between the morphology of the aortic arch and the technical difficulties of carotid angioplasty stenting, we presumed that the technical difficulty of endovascular SMA stenting would be associated with the morphology of the SMA arch, as defined by the curvature between the abdominal aorta and the proximal segment of the SMA. We classified the arches into 3 types based on their included angles. Type I included angles $>90°$, type II included angles between $45°$ and $90°$, and type III included angles $<45°$ (Fig. 1). The SMA arch types, approaches and corresponding technical successes or failures were analyzed in all 33 patients.

Treatment Algorithm and Medical, Endovascular, and Surgical Management

The medical, endovascular, and surgical management of SIDSMA and a preliminary treatment algorithm have been described previously.[1] Briefly, most SIDSMA cases without peritonitis can be successfully treated with medical therapy. Endovascular stent placement can safely and effectively restore SMA perfusion with a satisfactory patency rate in medically unsuccessful cases. For SIDSMA cases with peritonitis, endovascular stenting combined with laparoscopic exploration and/or open surgery might be a reasonable option.

Initially, the femoral approach was primarily selected for endovascular treatments not only because of its convenience but also because of the availability of sheathes with a larger diameter; however, technical failures in the cannulation of the true lumen or the introduction of the long sheath occasionally occurred. Thus, we began to become aware of the morphology of the SMA arch and frequently switched to the brachial approach via a cutdown exposure or even intentionally used this approach as the primary approach based on the arch type.

With respect to surgeries, in cases of a dynamic ischemia because of significant compression of the true lumen by the false lumen, open fenestration was performed; in cases of static ischemia due to thrombosis in the true and/or false lumina, thrombectomy combined with fenestration was performed.

Follow-Up Protocol

The patients were followed up with computed tomography angiography (CTA) at 3 months, 6 months, 12 months, and yearly thereafter. In addition, any presentations that indicated chronic intestinal ischemia, such as postprandial abdominal pain and weight loss, were recorded.

Statistical Analyses

The technical failure rates were compared between the femoral and brachial approaches using a Fisher's exact test performed using STATA 10.0. Ideally, this analysis could have been performed both within and between each SMA arch type group. However, given the small numbers of patients in the type I and type III groups, the statistical results of such analyses would not have been reasonable or persuasive. Therefore, comparisons of all the patients and those within the type II group (accounting for the greatest proportion 77.8% among all 3 types) were performed. The symptom-free survival rate was estimated using the Kaplan–Meier method.

RESULTS

Data from 33 patients with SIDSMA who were admitted into our center between July 2007 and September 2013, including 30 men and 3 women, were collected. The mean age of the patients was 54 ± 7 years (range, 46–70 years). The clinical manifestations included abdominal pain, lower back pain, abdominal distension, nausea, vomiting,