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Surgical Resection for Ruptured Aneurysm of Middle Colic Artery Caused by Segmental Arterial Mediolysis : A Case Report

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Abstract

Aneurysm of the middle colic artery is very uncommon. In this report, we describe a case of a ruptured aneurysm of the middle colic artery caused by segmental arterial mediolysis and its successful management by surgical resection. A 60-year-old Japanese man was admitted to our institution for the treatment of a ruptured aneurysm of the branch of the superior mesenteric artery suspected by computed tomography. Angiography revealed multiple wide and narrow mural irregularities and some aneurysms in the middle colic artery without extravasation. Transcatheter arterial embolization could not be accomplished because of difficulty in catheterization. Since radiological findings of the patient indicated worsening of the aneurysm, surgical resection was performed. Histopathological findings of the resected specimen were consistent with those of segmental arterial mediolysis. In cases where curative embolization cannot be accomplished, surgical resection is required. However, in a non-ruptured aneurysm, healing occurs gradually. Therefore, if the vital parameters of the patient are stable, conservative observation can be recommended.

Key Words: Visceral artery aneurysm; SAM; Surgery

Introduction

Visceral artery aneurysm is a relatively rare condition, and it commonly involves the splenic artery, hepatic artery, celiac artery, et al. Further, middle colic artery aneurysm is very uncommon¹⁾. A recent report suggested that visceral artery aneurysm can be caused by segmental arterial mediolysis (SAM). In this report, we describe a case of rupture of middle colic artery aneurysm caused by SAM and its successful management by surgical resection.

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Case Report

A 60-year-old Japanese man was seized with acute onset of upper abdominal pain. Four days later, he was brought to a local hospital by an ambulance with sudden loss of consciousness. He was diagnosed with hypertension at the age of 51, but he did not take any treatment for the same. Computed tomography (CT) showed a large fluid-filled loculated area in the retroperitoneal space in the left-upper abdomen (Fig. 1). Contrast-enhanced CT revealed an enhanced point in the fluid-filled area. On the basis of these findings, a ruptured aneurysm of the branch of the superior mesenteric artery was suspected, and the patient was transferred to our institution for interventional radiological treatment. He regained consciousness on admission to our institution and showed stable vital signs (systolic blood pressure of 112 mm Hg). Physical examination yielded no significant findings apart from upper abdominal tenderness. No signs of peritonitis were observed. Laboratory tests conducted on admission were unremarkable (white blood cell count, 9.9×10^3 /mm³; platelet, 17.6×10^3 /mm³), except for slight anemia (red blood cell count, 382×10⁴/mm³; hemoglobin, 11.8 g/dL; hematocrit, 35.0%). Coagulation panel was within normal limits. Emergency angiographic examination revealed multiple wide and narrow mural irregularities and some aneurysms in the wide sphere of the left branch of the middle colic artery (Fig. 2). However, no extravasation was detected. These radiological findings suggested that one of the aneurysms was ruptured and that the arterial irregularities were caused by SAM. We attempted to treat the aneurysms by transcatheter arterial embolization (TAE); however, this procedure was complicated by the difficulty in catheterization. Since the patient exhibited stable vital parameters and no extravasation, he was managed with conservative observation and blood pressure was controlled with calcium blockers. Although abdominal symptoms had gradually reduced, a follow-up CT obtained after



Figure 1. Computed tomography showed a large fluidfilled loculated area in the retroperitoneal space in the left-upper abdomen.



Figure 2. Angiographic examination of the superior mesenteric artery revealed revealed multiple wide and narrow mural irregularities (arrowhead) and some aneurysms (arrow) in the wide sphere of the left branch of the middle colic artery.

12 days suggested an increase in the size of the hematoma. Since the radiological findings indicated worsening of the aneurysm, the patient underwent operation. Laparotomy revealed that the hematoma was present in the retroperitoneal space extending from pancreatic body into mesenterium of the sigmoid colon. The hematoma was attached to the surrounding tissues. Partial resection of transverse colon with a primary anastomosis was performed, and the hematoma and the irregular left branch of the middle colic artery were resected. The operation time was 191 min and blood loss was 60 mL. There were some additional aneurysms in the resected specimen of the left branch of the middle colic artery. Histological examination of the involved arterial wall specimen revealed an aneurysm with a large arterial gap with loss of intima, media, and elastic lamina (Fig. 3). In the other portion of the involved artery, smooth muscle cells in the outer media, involving half of the arterial wall circumference, exhibited cytoplasmic vacuolization with the preservation of the intima and internal elastic lamina (Fig. 4). Further, the artery without aneurysmal changes showed fibrous granulation tissue in the outer media with outward bowing of the external elastica and preservation of the elastic lamina (Fig. 5). There was no evidence of atherosclerotic changes or inflammatory vasculitis. These



Figure 3. Histochemical examination of the involved arterial wall specimen revealed an aneurysm with a large arterial gap with loss of intima, media, and elastic lamina. Elastica van Gieson stain $\times 40$.



Figure 4. In the other portion of the involved artery, smooth muscle cells in the outer media exhibited cytoplasmic vacuolization. Hematoxylin and eosin stain $\times 100$.



Figure 5. Histochemical examination of the artery without aneurysmal change showed fibrous granulation (arrowhead) in the outer media with preservation of the elastic lamina. Elastica van Gieson stain $\times 40$.

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histopathological findings were thought to be consistent with those of SAM. Postoperative enhanced CT and magnetic resonance imaging did not show aneurysm in any other regions. After an uneventful postoperative course, the patient was discharged on the 10th postoperative day.

During the 8-month follow-up period, the patient showed good recovery without any complications.

Discussion

Visceral arterial aneurysm is uncommon and it generally affects sites in visceral arteries such as splenic artery (60%), hepatic artery (20%), superior mesenteric artery (5.5%), celiac artery(4%), and gastric and gastroepiploic arteries $(4\%)^{1,2}$. Particularly, middle colic artery aneurysm is very uncommon $(0.3\%)^{1,2}$.

Visceral arterial aneurysm was considered to be related to arteriosclerosis, medial degeneration, trauma, bacterial alteration, or collagen disease^{1,2)}. Recently, it has been reported that SAM contributes to visceral artery aneurysm.

Slavin et al described SAM as a noninflammatory and nonatherosclerotic vascular disease that mainly affects the visceral arteries of the muscular type in middle-aged or elderly persons of both genders³⁻⁶⁾. SAM is characterized by the involvement of visceral arteries, and less frequently the intracranial, coronary, or pulmonary arteries⁷⁾. The mediolysis of arteries results in the formation of arterial gaps and aneurysms and ultimately leads to arterial rupture^{3,4)}. The common clinical outcomes of aneurysm rupture are sudden cardiovascular collapse, intra-abdominal hemorrhage, and acute abdomen^{4,8)}. The mortality rates after aneurysm rupture are approximately 20%-50%⁶⁾.

Therefore, emergency surgical intervention is frequently needed³⁾.

The cause of SAM is still unclear. However, some theories have proposed that repeated vasoconstrictive responses^{5,8)} or immune dysfunction⁸⁾ may be the causes of SAM. Since our patient had a history of hypertension, the vasoactive factor might be associated with SAM.

Histologically, SAM is characterized by mediolysis that begins with the vacuolization and separation of the media from the adventitia in outer media. Consequently, these changes dissect the hematoma, create an arterial gap, and lead to aneurysm rupture^{4,5,7,9)}.

Although the definitive diagnosis of SAM requires histopathologic evaluation of arterial lesions, angiographic findings can also help in the diagnosis of this condition¹⁰⁻¹².

The angiographic findings of SAM were in agreement with the histologic changes and showed 6 presentations: (a) arterial dilatation, (b) single aneurysm, (c) multiple aneurysms, (d) dissecting hematomas, (e) arterial stenosis, and (f) arterial occlusions⁴.

For a patient with visceral artery aneurysm, interventional radiological treatment and TAE should be applied initially. TAE facilitates the diagnosis and treatment of the aneurysm and is less invasive than surgical procedures^{1,10,11}. On the other hand, TAE is associated with risks of rebleeding, recurrence of aneurysms, or bowel ischemia¹. But, recently, TAE has performed safely with low morbidity and mortality rates with advancement of the catheterization technique and embolic agents^{1,11}. Surgical procedures including arterial ligation, aneurysmectomy, and intestinal resection are required, if curative embolization cannot be accomplished.

It is unclear how the form and size of a non-ruptured aneurysm caused by SAM would change.

Follow-up imaging examinations of non-ruptured visceral aneurysm have revealed that the size of aneurysms decreases over a period of time^{3,12)}. In a non-ruptured aneurysm, the lytic portion of media of the arterial wall is repaired and replaced by granulation tissue, and healing occurs gradually without the disruption of the intima and internal elastic lamella^{4,5,9)}. In our patient, the thickening of the outer media of artery without aneurysmal change (Fig. 5) indicated reparative stage of a non-ruptured aneurysm in SAM. Therefore, conservative observation may be suggested for the management by of a patient who has undergone incomplete TAE, if the patient's vital signs are stable and no hemorrhage is suspected.

SAM of abdominal arteries usually involves more than 1 visceral artery^{3,4)}, and the branches of the celiac artery are much frequently affected⁵⁾.

In middle-aged or elderly patients, the visceral arteries are most commonly affected^{4,5)}. However, in young adults, the cerebral arteries are occasionally involved. In addition, other lesions were detected during follow-up examination after treatment of SAM^{10,12}. Therefore, the screening of the abdominal and extra-abdominal arteries is recommended after emergency treatment^{3,7,8)} and long-term observation is necessary.

In conclusion, the rupture of middle colic artery aneurysm caused by SAM was treated by surgical intervention. Aneurysms caused by SAM should be initially treated by interventional radiological treatment and TAE. If TAE cannot be accomplished, surgical resection can be performed. In patients with stable condition, conservative observation is recommended. However, long-term observation is necessary for SAM patients because SAM can affect multiple arteries spatiotemporally.

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