

Potentially stress-induced acute splanchnic segmental arterial mediolysis with a favorable spontaneous outcome

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A 62-year-old woman presented with hemithoracic anesthesia and acute abdominal pain following a violent psychological stress. Magnetic resonance imaging showed a thoracic hematoma with arachnoiditis of the spinal cord. Tomography revealed a typical aspect of segmental arterial mediolysis with multiple aneurysms and stenoses of the splanchnic arteries, confirmed by abdominal arteriography. There was no argument for hereditary, traumatic, atherosclerotic, infectious, or inflammatory arterial disease. Segmental arterial mediolysis was diagnosed on the basis of the radiologic data and probably involved both medullary and splanchnic arteries. The patient spontaneously recovered and was in good health 18 months later. (*J Vasc Surg Cases and Innovative Techniques* 2017;3:26-9.)

Segmental arterial mediolysis (SAM) is a rare, noninflammatory arterial disease of unknown origin described by Slavin and Gonzalez-Vitale.¹ Up to January 2014, only 85 cases had been reported²; to date, 4 more cases have been published. SAM is characterized by arterial stenoses and aneurysms in mesenteric, renal, and cerebral territories due to the lysis of the arterial media. With the written informed consent of the patient, we report a case of potentially stress-induced acute SAM associated with medullary lesions.

CASE REPORT

A 62-year-old woman was admitted a few hours after an acute psychological stress consisting of an ultraviolent physical assault of her husband in front of her. She presented with right thoracic anesthesia, acute abdominal pain, and vomiting. She had no familial or personal medical history, in particular no cardiovascular risk factors. She did not report any physical trauma.

Clinical examination revealed anesthesia of the right breast and scapular areas, increased deep tendon reflexes, and acute urinary retention. Blood pressure was 139/83 mm Hg. There was no fever, no Babinski sign, no abnormality of rectal tonus, no sign of peritonitis, and no joint or skin abnormalities.

Blood test analyses showed the following values: C-reactive protein, 68 mg/L (normal, <5); prothrombin time, 100%; normal activated partial thromboplastin time; neutrophils, 9.4 g/L

(normal, 1.5-7); platelets, 692 g/L (normal, 150-450); bilirubin, 5 μmol/L (normal, 2-17); aspartate aminotransferase, 22 U/L (normal, 15-37); alanine aminotransferase, 122 U/L (normal, 12-78); γ-γglutamyltransferase, 316 U/L (normal, 84-246); and alkaline phosphatase, 184 U/L (normal, <126). Lipase, glucose, creatinine, and cholesterol concentrations were normal. Further tests were performed to rule out infection, vasculitis, and myelitis. Results of hemoculture, urine culture, and serologic tests for hepatitis B virus, hepatitis C virus, herpes simplex virus, varicella-zoster virus, human immunodeficiency virus, syphilis, *Rickettsia*, and *Coxiella* were negative. Search results for antinuclear, anti-cyclic citrullinated peptide, and antineutrophil cytoplasmic antibodies were negative; complement was normal. The cerebrospinal fluid analysis revealed 8 cells/mm³ and 1.3 g/L of proteins without any bacteria.

Magnetic resonance imaging (Fig 1) showed a thoracic hemorrhage with a mass effect on the spinal cord at the T3 level and diffuse arachnoiditis. Computed tomography angiography of supra-aortic arteries was normal. The abdominal computed tomography scan disclosed a stenosis of the distal segment of the superior mesenteric artery due to a parietal hematoma. Multiple fusiform irregular aneurysms and stenoses of digestive (right gastroepiploic, left hepatic, ileal, colic) arteries were also found (Fig 2). The findings on fluorodeoxyglucose scintigraphy were normal, ruling out an active vasculitis of the large vessels.

A temporal artery biopsy, performed on the hypothesis of giant cell arteritis, showed nonspecific medial fibrosis and no intimal lesion.

The patient received an anxiolytic and antalgic treatment with alprazolam (0.25-0.5 mg/6 h), tramadol chlorhydrate (50-100 mg/6 h), and paracetamol (1 g/8 h) and clinically recovered within 2 weeks. She did not undergo any surgery or endovascular procedure.

Medullary and abdominal arteriography (Fig 3) was performed 15 days after admission to look for medullary vascular abnormalities; this confirmed splanchnic arterial abnormalities but did not show any medullary arterial lesion. Three weeks after admission, the patient had no residual symptoms; the C-reactive protein level was <5 mg/L, and the patient was discharged. One year later, abdominal computed tomography showed a

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Fig 1. **A**, Sagittal T1-weighted medullary magnetic resonance imaging (MRI) without administration of a contrast agent revealed a spontaneous hypersignal due to hemorrhage (*arrow*) at the T3 level. **B**, Sagittal T2-weighted medullary MRI showed heterogeneous filling of the subdural space (*arrow*) and a mass effect on the spinal cord (*star*) at the T3 level. **C**, Sagittal T1-weighted medullary MRI after gadolinium injection exhibited diffuse arachnoiditis (*arrowhead*) and hematic heterogeneous subdural filling (*arrow*). **D**, Axial T1-weighted medullary MRI after gadolinium injection showed a contrast enhancement of the arachnoid membrane (*arrowhead*), a hematic heterogeneous epidural filling (*arrow*), and a mass effect on the spinal cord that appeared shifted to the left (*star*).

partial regression of the right gastroepiploic aneurysm, a spontaneous total regression of all other aneurysms, and stenoses of the superior mesenteric artery. One more year later, the patient was in good health but still had a 6-mm aneurysm of the right gastroepiploic artery.

DISCUSSION

SAM is an acute noninflammatory artery disease characterized by arterial stenosis and aneurysms leading to acute episodes of thrombosis and hemorrhage.³ SAM has mostly been described in people older than 40 years.

The cause of SAM is still unknown. Nevertheless, several arguments suggest that the association of acute stress and SAM, as described in our case report, is probably not an incidental finding. First, a causative relationship between SAM and β_2 agonist administration has been established through animal experiments. Slavin and Yaeger have demonstrated that the oral administration of a single dose of ractopamine, a β_2 -adrenergic agonist

drug, induced SAM in greyhound dogs.⁴ Indeed, characteristic arterial lesions of the early injurious stage of SAM were observed 4 days after the administration of the β_2 agonist, as were typical alterations of the reparative stage of SAM 17 days later. Slavin and Yaeger concluded that SAM might be caused by iatrogenic or accidental exposure to catecholamine release. Second, experimental studies have shown an excess of catecholamine release during acute mental stress in patients suffering from takotsubo,⁵ a rare reversible cardiomyopathy that is triggered by acute stress (such as intense fear) in two of three cases. Those data, combined with our observation of SAM following an acute psychological stress, suggest that SAM might be due to intake of adrenergic agonists or catecholamine hyper-reactivity.

SAM usually involves mesenteric, renal, and cerebral arterial territories. Medullary involvement has never been reported before. In the case that we described, we suspected that SAM was responsible for the

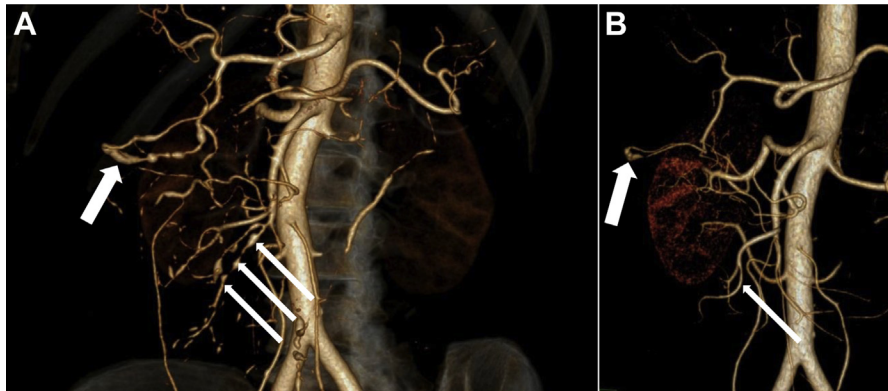


Fig 2. Abdominal computed tomography scan with three-dimensional reconstruction revealed aneurysmal lesions of the right gastroepiploic artery (**A**; large arrow) as well as alternating irregular aneurysms and stenoses of the superior mesenteric artery (**A**; thin arrows) that decreased (**B**; large arrow) or disappeared (**B**; thin arrow) 3 weeks later.



Fig 3. Celiac arteriography showed a long irregular aneurysm (arrow) of the right gastroepiploic artery, with a maximal diameter of 8 mm, associated with arterial stenoses.

medullary hematoma in the absence of another identified cause. Indeed, epidural spinal hematoma is a rare condition with an incidence of 0.1 per 100,000/y.⁶ In 40% to 50% of the cases, the etiology remains unknown.⁷ In the other cases, the identified risk factors are trauma surgery, epidural catheter, genetic coagulopathy, use of anticoagulants,⁸ hypertension, arteriovenous malformation, tumor, infections, autoimmune disease, cardiovascular disease,⁹ and sickle cell disease.¹⁰ Here, given the association of two rare diseases such as SAM and epidural spinal hematoma, and given the fact that alternative diagnoses had been ruled out, we suspected the potent role of SAM in the induction of medullary hematoma.

The diagnosis of SAM should be based on pathologic findings.¹ However, because arterial biopsy is not often possible, both clinical and imaging features can help make the diagnosis of SAM³; those features include multiple irregular aneurysms of medium-caliber

collateral branches of splanchnic arteries, intramural hematomas responsible for arterial stenosis, and possibly a spontaneous favorable outcome. The diagnosis of SAM consists of an elimination process. Vasculitis must be ruled out by autoantibody testing and by histopathologic examinations to look for vascular inflammatory infiltrates. Even though young age, unique renal localization, and chronicity are in favor of fibromuscular dysplasia (FMD), FMD and SAM are sometimes associated, and the distinction between FMD and SAM remains unclear. Objective criteria are yet to be established.¹¹

The outcome of SAM is unpredictable. At the onset of the disease, the vital prognosis is often engaged with a high rate of mortality due to hemorrhage or thrombosis.³ Endovascular intervention is thus the preferred treatment. Nevertheless, some cases of nonsymptomatic localizations¹² and some reports of spontaneous regression¹³⁻¹⁵ have been described. In those cases, the treatment is not codified.

In our case report, the outcome was favorable without any specific treatment. However, surgical or endovascular therapy can be performed in case of bleeding or severe arterial stenosis.¹⁶⁻²⁰

CONCLUSIONS

SAM is a noninflammatory arterial disease involving great or medium arteries in digestive, renal, or cerebral territories. Medullary arteries can also be affected. Even if life-threatening complications such as hemorrhage or thrombosis can occur, often requiring endovascular intervention, some spontaneous regression may be observed. The etiology of SAM is still unknown, but animal and human experimental studies suggest a role for intake of adrenergic agonist substances or catecholamine hyper-reactivity to stress.

REFERENCES

1. Slavin RE, Gonzalez-Vitale JC. Segmental mediolytic arteritis: a clinical pathologic study. *Lab Invest* 1976;35:23-9.

2. Shenouda M, Riga C, Naji Y, Renton S. Segmental arterial mediolysis: a systematic review of 85 cases. *Ann Vasc Surg* 2014;28:269-77.
3. Slavin RE. Segmental arterial mediolysis: course, sequelae, prognosis, and pathologic-radiologic correlation. *Cardiovasc Pathol* 2009;18:352-60.
4. Slavin RE, Yaeger MJ. Segmental arterial mediolysis—an iatrogenic vascular disorder induced by ractopamine. *Cardiovasc Pathol* 2012;21:334-8.
5. Smeijers L, Szabó BM, van Dammen L, Wonnink W, Jakobs BS, Bosch JA, et al. Emotional, neurohormonal, and hemodynamic responses to mental stress in Tako-Tsubo cardiomyopathy. *Am J Cardiol* 2015;115:1580-6.
6. Holtås S, Heiling M, Lönnroft M. Spontaneous spinal epidural hematoma: findings at MR imaging and clinical correlation. *Radiology* 1996;199:409-13.
7. Foo D, Rossier AB. Preoperative neurological status in predicting surgical outcome of spinal epidural hematomas. *Surg Neurol* 1981;15:389-401.
8. Boukobza M, Guichard JP, Boissonet M, George B, Reizine D, Gelbert F, et al. Spinal epidural haematoma: report of 11 cases and review of the literature. *Neuroradiology*. 36:456-9.
9. Groen RJ, Ponsen H. The spontaneous spinal epidural hematoma: a study of the etiology. *J Neurol Sci* 1990;98:121-38.
10. Serarslan Y, Aras M, Altaş M, Kaya H, Urfaló B. Non-traumatic spontaneous acute epidural hematoma in a patient with sickle cell disease. *Neurocirugia (Astur)* 2014;25:128-31.
11. Hall ET, Gibson BA, Hennemeyer CT, Devis P, Black S, Larsen BT. Segmental arterial mediolysis and fibromuscular dysplasia: what comes first, the chicken or the egg? *Cardiovasc Pathol* 2016;25:113-5.
12. Hirakawa E, Inada K, Tsuji K. Asymptomatic dissecting aneurysm of the coeliac artery: a variant of segmental arterial mediolysis. *Histopathology* 2005;47:544-6.
13. Michael M, Widmer U, Wildermuth S, Barghorn A, Duewell S, Pfammatter T. Segmental arterial mediolysis: CTA findings at presentation and follow-up. *AJR Am J Roentgenol* 2006;187:1463-9.
14. Gaud S, Cridlig J, Claudon M, Diarrassouba A, Kessler M, Frimat L. [Segmental arterial mediolysis and renovascular hypertension]. *Nephrol Ther* 2010;6:597-601.
15. Baker-LePain JC, Stone DH, Mattis AN, Nakamura MC, Fye KH. Clinical diagnosis of segmental arterial mediolysis: differentiation from vasculitis and other mimics. *Arthritis Care Res* 2010;62:1655-60.
16. Chao CP. Segmental arterial mediolysis. *Semin Intervent Radiol* 2009;26:224-32.
17. Ushijima T, Izumo A, Matsumoto T, Taniguchi K, Uchida T. Pancreaticoduodenal artery pseudoaneurysm caused by segmental arterial mediolysis: a case report of surgical treatment. *Ann Vasc Dis* 2013;6:198-201.
18. Nishikawa Y, Hoshina K, Sasaki H, Hosaka A, Yamamoto K, Okamoto H, et al. Acute remodeling of an adjoining aneurysm after endovascular treatment of a ruptured splanchnic arterial aneurysm: a case of clinically diagnosed segmental arterial mediolysis. *Ann Vasc Dis* 2012;5:449-53.
19. Naitoh I, Ando T, Shimohira M, Nakazawa T, Hayashi K, Okumura F, et al. Hemosuccus pancreaticus associated with segmental arterial mediolysis successfully treated by trans-arterial embolization. *JOP* 2010;11:625-9.
20. Obara H, Matsubara K, Inoue M, Nakatsuka S, Kuribayashi S, Kitagawa Y. Successful endovascular treatment of hemosuccus pancreaticus due to splenic artery aneurysm associated with segmental arterial mediolysis. *J Vasc Surg* 2011;54:1488-91.

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