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Case Report Open Access

Endovascular flow-diversion of splenic artery aneurysm using double-layer micromesh carotid stent

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ABSTRACT

Splenic artery aneurysms (SAAs) are rare but potentially life-threatening, with rupture rates of 3-10%. While most remain asymptomatic, those larger than 2 cm are at increased rupture risk, necessitating intervention. This report discusses the successful endovascular treatment of a 52-year-old male with a 22×26×24 mm SAA using a double-layer micromesh carotid stent. The procedure involved deploying two overlapping stents, achieving complete aneurysm thrombosis without complications. Endovascular methods, particularly stent grafting, have become preferred due to their lower morbidity compared to open surgery. The use of flexible, flow-diverting stents in tortuous anatomy demonstrates promising results, although further studies are needed for long-term outcomes.

Keywords: Endovascular treatment, splenic artery aneurysm, visceral artery aneurysm.

Aneurysms of intra-abdominal visceral arteries are rare but can be associated with a high mortality rate, if rupture occurs.[1-3] Nearly 80% of these aneurysms remain asymptomatic and are often diagnosed incidentally.[4] Among visceral artery aneurysms, those of the splenic artery constitute approximately 60%, making them the most common intra-abdominal aneurysms after those of the abdominal aorta and iliac arteries. The most serious complication of splenic artery aneurysms (SAAs) is rupture, occurring in about 3 to 10% of cases, which may lead to life-threatening hemorrhage or fistulation into adjacent organs.[1-4]

In this article, we report a case of an SAA successfully treated with a double-layer micromesh carotid stent using an endovascular approach and discuss the endovascular management of SAAs in the light of existing literature.

CASE REPORT

A 52-year-old male patient was referred to our institution following an abdominal ultrasonographic examination which revealed an enlarged splenic artery. He presented with left upper quadrant abdominal pain, but had no prior history of abdominal trauma, surgery, or significant comorbidities. A contrast-enhanced computed tomography angiography (CTA) confirmed an aneurysmal dilation measuring 22×26×24 mm in the mid-to-distal segment of the splenic artery (Figure 1). Given the size of the aneurysm, an endovascular approach was preferred for the treatment.

The procedure was performed under local anesthesia. Using the Seldinger technique, a 7-Fr intra-arterial sheath was introduced into the right femoral artery. A 0.014-inch guidewire (Hi-Torque Command™ Peripheral Workhorse Guidewires, Abbott Cardiovascular, MN, USA) was advanced into the celiac artery and subsequently into the splenic artery with the assistance of an INVAMED™

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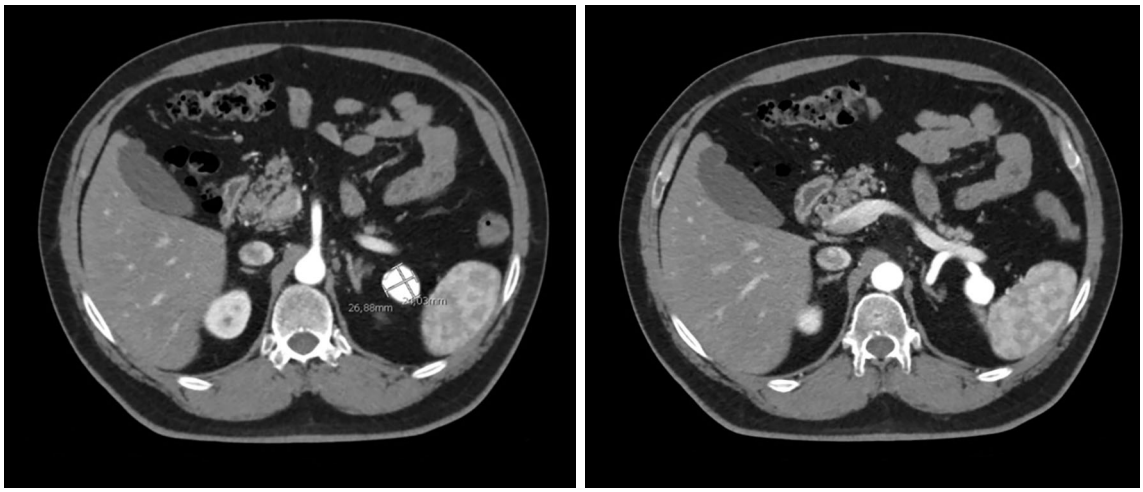

Figure 1. A contrast-enhanced computed tomography angiography showing an aneurysmal dilation in the mid-to-distal segment of the splenic artery, measuring 22×26×24 mm.

support catheter (INVAMED, Ankara, Türkiye). Selective angiography delineated the location of the aneurysm. A stiff wire (ZIPwire, Stiff Type, Boston Scientific, MA, USA) was, then, positioned within the splenic artery and later exchanged for a Hi-Torque Steelcore 18 LT (0.018x300 cm, Workhorse 0.018) to ensure adequate support.

A 7 mm x 30 mm double-layer micromesh carotid stent (Roadsaver®, Terumo, Tokyo, Japan) was deployed across the aneurysm sac. Post-placement angiography demonstrated residual proximal filling of the aneurysm sac, necessitating the deployment of a second stent (8×30 mm) overlapping the first. Subsequent angiography revealed cessation of turbulence and antegrade flow into the aneurysm sac, with only minor retrograde filling observed. The procedure was completed upon removal of the support system and wires. The patient was discharged on the second postoperative day without complications. A follow-up CTA performed one month later confirmed complete aneurysm thrombosis without evidence of endoleak (Figure 2a, b). Following the procedure, the patient was initiated on dual antiplatelet therapy (DAPT; acetylsalicylic acid [ASA] plus clopidogrel). At the end of the first year, the treatment plan was

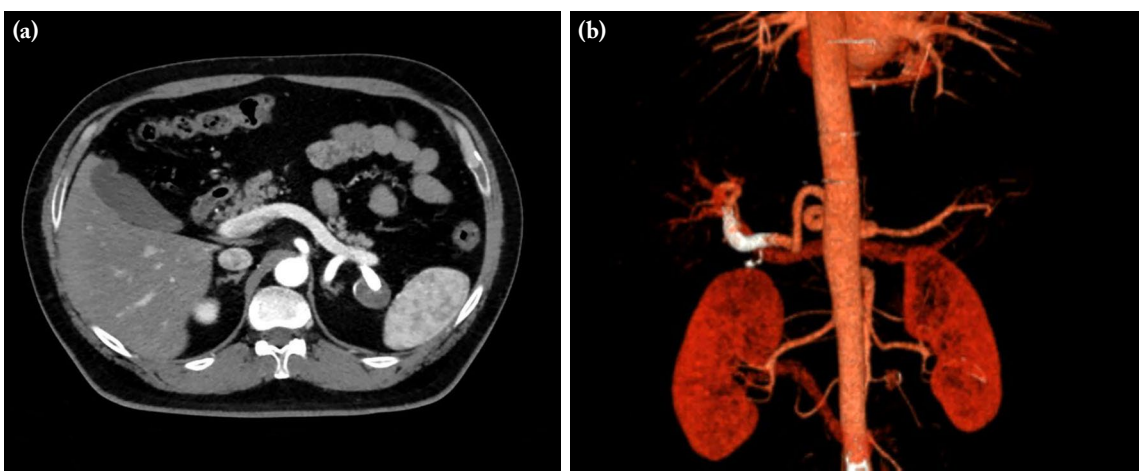

Figure 2. **(a)** A follow-up CTA performed one month later confirming a complete thrombosis of the aneurysm without signs of an endoleak. **(b)** The 3D CTA reconstruction shows the positioning of the implanted stent.
3D CTA: Three-dimensional computed tomography angiography.

to discontinue clopidogrel and continue antiplatelet therapy with ASA alone. Written informed consent was obtained from the patient.

DISCUSSION

An SAA is characterized by an arterial dilation exceeding 1 cm in diameter or more than 50% of the normal vessel diameter.[3] Conservative management is typically reserved for aneurysms between 1 and 2 cm, while intervention is recommended for those exceeding 2 cm due to an elevated risk of rupture. The precise etiology remains unclear; however, factors such as previous abdominal surgery, portal hypertension, pregnancy-related hormonal changes, fibromuscular dysplasia, collagen vascular disorders, medial degeneration, pancreatitis, atherosclerosis, and systemic hypertension have been implicated.[1,2] Notably, these aneurysms are four times more prevalent in women than men.[5]

In general, three primary treatment modalities exist: open surgery, endovascular interventions, and conservative observation. Historically, open surgical repair was the standard approach, offering durable results but at the cost of significant perioperative morbidity and potential splenectomy. Conversely, conservative management carries a persistent risk of rupture, with reported mortality rates ranging from 10 to 25% in cases of aneurysm rupture.[3-6]

In recent years, endovascular interventions have gained prominence due to their minimally invasive nature and lower short-term complication rates. Among these techniques, coil embolization has been widely utilized, but it carries a substantial risk of splenic infarction, particularly in distal aneurysms, with ischemic complications occurring in approximately 40% of cases.[1,2,5] Stent grafting, in contrast, maintains splenic perfusion while excluding the aneurysm, thereby minimizing ischemic risk. The literature reports splenic infarction in approximately 11% of patients treated with stent grafting.[5]

Despite the increasing use of endovascular therapy for SAAs, reports on the application of stent grafts remain limited. A review by Ouchi et al.[5] identified 27 cases treated with stent grafts, of which 17 cases were further analyzed. Among these, two cases exhibited splenic infarction, while one case experienced stent migration and occlusion. The procedural challenge of navigating stent grafts through the tortuous anatomy of the splenic artery remains a significant limitation.

In the present case, the high tortuosity of the splenic artery precluded the use of conventional covered stents, necessitating the selection of a more flexible device. The stent we used offers practical advantages due to its superior technical features, including enhanced flexibility and vessel wall conformability. The Roadsaver® double-layer micromesh carotid stent was chosen for its adaptability and capacity to facilitate aneurysm thrombosis while preserving arterial patency. The dual-layer structure of the stent provided an effective flow-diversion mechanism, leading to successful aneurysm exclusion.

Recent case reports have documented the use of double-layer micromesh stents in the treatment of renal, visceral, and peripheral artery aneurysms.[6] These reports highlight the technical success of this approach, particularly in complex vascular anatomies. In the present case, complete aneurysm thrombosis and uninterrupted splenic perfusion were confirmed at one-month follow-up, underscoring the efficacy of this technique.

In conclusion, splenic artery aneurysms pose a significant risk of rupture and hemorrhagic complications, necessitating timely intervention when their diameter exceeds 2 cm. The increasing utilization of endovascular techniques, facilitated by technological advancements, has shifted treatment paradigms away from traditional open surgical repair. Double-layer micromesh flow-diverting stents may constitute a favorable endovascular approach, particularly in the management of aneurysms associated with tortuous vascular configurations. Owing to their enhanced flexibility, efficacy in aneurysm exclusion, and maintenance of arterial patency, these devices may offer a superior alternative to traditional covered stents. Nevertheless, further high-quality, large-scale investigations with extended follow-up are warranted to clarify long-term outcomes and to establish evidence-based treatment guidelines for SAAs. Taken together, our case illustrates the practical applicability of this stent and its favorable early-phase adaptability to the vessel, offering preliminary evidence to inform future research.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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REFERENCES

1. Wang T, Wang J, Zhao J, Yuan D, Huang B. Endovascular treatment of aberrant splenic artery aneurysm presenting with painless progressive jaundice: A case report and literature review. Vasc Endovascular Surg 2021;55:756-60. doi: 10.1177/15385744211005296.
2. Zhu C, Zhao J, Yuan D, Huang B, Yang Y, Ma Y, et al. Endovascular and surgical management of intact splenic artery aneurysm. Ann Vasc Surg 2019;57:75-82. doi: 10.1016/j.avsg.2018.08.088.
3. Salimi J, Foroutani L, Miratashi Yazdi SA. Management of huge splenic artery aneurysm with new hybrid procedure including endovascular and open surgical approach: Case series. Int J Surg Case Rep 2021;89:106585. doi: 10.1016/j.ijscr.2021.106585.
4. Vemireddy LP, Majlesi D, Prasad S, Tahir N, Parkash O, Jeelani HM, et al. Early thrombosis of splenic artery stent graft. Cureus 2021;13:e16285. doi: 10.7759/cureus.16285.
5. Ouchi T, Kato N, Nakajima K, Higashigawa T, Hashimoto T, Chino S, et al. Splenic artery aneurysm treated with endovascular stent grafting: A case report and review of literature. Vasc Endovascular Surg 2018;52:663-8. doi: 10.1177/1538574418785252.
6. van Veenendaal P, Maingard J, Kok HK, Ranatunga D, Buckenham T, Chandra RV, et al. Endovascular flow-diversion of visceral and renal artery aneurysms using dual-layer braided nitinol carotid stents. CVIR Endovasc 2020;3:33. doi: 10.1186/s42155-020-00125-2.