



# Takayasu Arteritis Complicated with Vertebral Artery Dissection Aneurysm Treated Endovascularly: Report of One Case

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## ABSTRACT

Takayasu arteritis (TA) is a chronic granulomatous large-vessel vasculitis that primarily affects the aorta and its major branches, such as the subclavian, carotid, and renal arteries. Pathologically, it is characterized by transmural infiltration of lymphocytes and macrophages with granulomatous inflammation, leading to intimal fibrosis and thickening, destruction of medial elastic fibers, and subsequent luminal stenosis or occlusion. Aneurysmal dilation may occur in some cases. We here report a case of TA complicated by a vertebral artery dissecting aneurysm. Our patient was a 47-year-old male who had previously undergone surgical interventions at our institution for a common iliac artery aneurysm and splenic artery aneurysm 6 years and 2 years prior to the present admission, respectively. Most recently, the patient was presented with right shoulder pain and was subsequently diagnosed with a right vertebral artery dissecting aneurysm, for which endovascular intervention was performed. This case underscores the critical importance of long-term clinical surveillance in patients with TA, along with the necessity for aggressive treatment of aneurysms that are identified to have a high risk of rupture.

**KEYWORDS:** Takayasu arteritis, Aneurysm, Arterial dissection, Interventional radiology

## INTRODUCTION

Takayasu arteritis (TA) predominantly affects young women aged  $\leq 40$  years, with a reported prevalence ranging from approximately 1.1 to 40 cases per million population (4,11). The disease is primarily characterized by intimal thickening of the aorta and its major branches, leading to vessel wall thickening and luminal stenosis (9). In a subset of patients, inflammatory destruction of the arterial media, elastic fibers, and smooth muscle fibers may result in the formation of aneurysms (12,13). Rupture of these aneurysms is associated with high rates of morbidity and mortality, significantly compromising patient prognosis (7). Therefore, early diagnosis

and prompt therapeutic intervention are critical to improving outcomes in affected individuals.

Here, we present the case of a 47-year-old male patient with concomitant TA and vertebral artery dissecting aneurysm who underwent endovascular interventional therapy, and we review the related literature.

## CASE REPORT

This study was conducted according to the latest revision of the Helsinki Declaration regarding medical research involving human subjects. Informed written consent was acquired from

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the patient before the study. No IRC board approval was needed for this case report because the patient's identity was kept anonymous.

In March 2019, a 47-year-old male patient who presented with abdominal pain underwent abdominal and lower extremity vascular ultrasound as well as computed tomography angiography (CTA) at our hospital. The imaging revealed an aneurysm of the right common iliac artery, aneurysmal dilation of the superior mesenteric artery, a right renal artery aneurysm, and ulceration of the left renal artery. After consultation with the radiology and rheumatology departments, the patient was diagnosed with TA. During hospitalization, the patient underwent an aortobifemoral bypass graft procedure. In December 2022, the patient experienced rupture and hemorrhage of a splenic artery aneurysm and was admitted to our hospital for splenic artery ligation, during which a blood transfusion was administered (Figure 1).

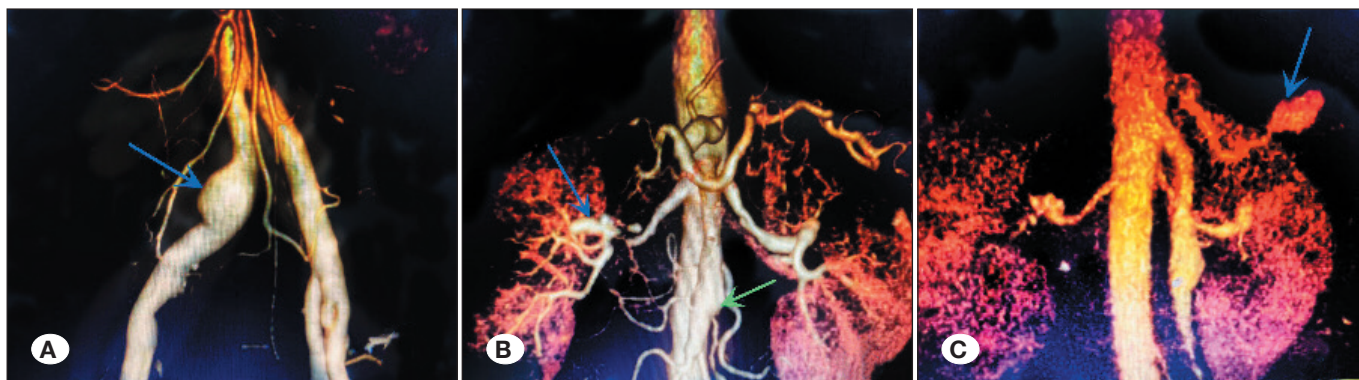
Two years later, the patient was admitted with a 2-day history of pain in the right shoulder radiating to the occipital and right temporal regions, accompanied by nausea, vomiting, limb weakness, and mental lethargy. A cranial CT scan performed at a local hospital revealed a high-density lesion anterior to the brainstem in the posterior cranial fossa, suggestive of an aneurysm. For further management, the patient was transferred to the neurosurgery department of our hospital. CTA of the head and neck identified a dissecting aneurysm of the right vertebral artery (Figure 2).

Cerebral angiography revealed a dissecting aneurysm at the V4 segment of the right vertebral artery, with a size of approximately  $7.8 \times 7.5$  mm. Subsequently, the aneurysm was treated with LVIS stent-assisted embolization. Intraoperative angiography showed dense embolization of the aneurysm, with the stent deployed effectively and the vertebral artery remaining patent. At the 12-month postoperative evaluation, magnetic resonance angiography imaging showed successful aneurysm exclusion with no signs of recurrence in the right vertebral artery dissection segment (Figure 2).

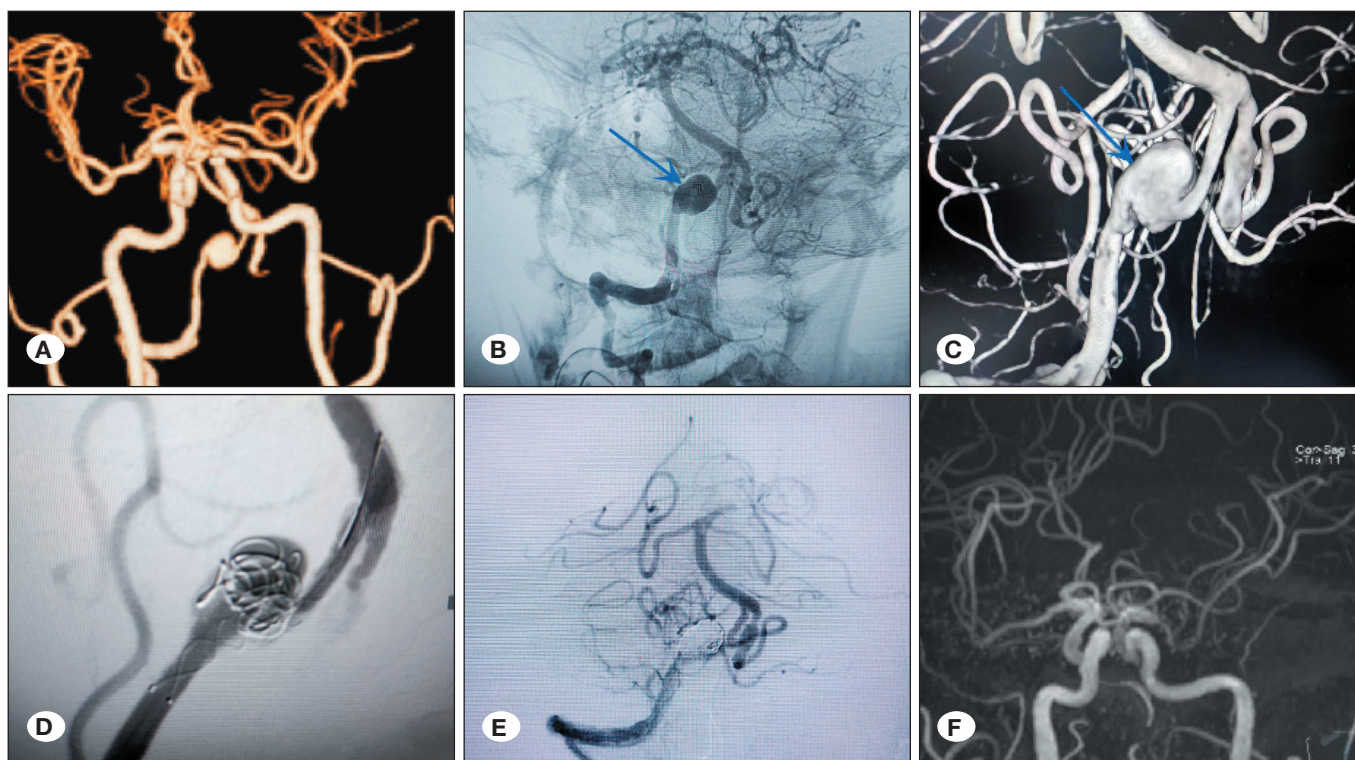
## DISCUSSION

The prevalence of aneurysms in patients with TA is relatively low, with aneurysms predominantly localized in the aorta and its major branches, particularly the subclavian artery, carotid artery, renal artery, and abdominal aorta. Epidemiological studies have reported that the incidence of aneurysms in patients with TA ranges from approximately 16.6% to 31.1% (2,8). In the management of TA-associated aneurysms, pharmacological therapy plays a central role in controlling inflammatory activity, mitigating disease progression, and reducing the risk of aneurysm expansion. Therapeutic regimens typically include glucocorticoids, immunosuppressants (e.g., methotrexate and azathioprine), and biologic agents (e.g., infliximab and tocilizumab). Emerging evidence from recent studies suggests that biologic agents demonstrate superior efficacy and a more favorable safety profile compared with glucocorticoids, with lower complication rates and improved clinical outcomes (5,10). Surgical intervention remains a critical component of treatment, especially for patients with significant compressive symptoms or those at high risk of rapid aneurysm expansion or rupture. Traditional open surgery is generally reserved for cases where endovascular approaches are not feasible. In contrast, endovascular intervention has become the preferred modality for patients with anatomically complex aneurysms or those deemed unsuitable for open surgical procedures due to comorbidities or other risk factors (6,14).

In this case, the patient had a history of ruptured splenic artery aneurysm, and the presence of a large vertebral artery dissecting aneurysm posed an imminent risk of rupture, thus necessitating prompt intervention. Vertebrobasilar artery dissecting aneurysms (VBDAs) are relatively rare, accounting for approximately 3.2–5.5% of all intracranial aneurysms (1). Rupture of such aneurysms can lead to acute hydrocephalus due to hematoma obstruction of the fourth ventricle, and in severe cases, brainstem compression by the hematoma may result in respiratory and circulatory compromise (3). Given the challenges associated with the complex anatomical location of VBDAs, including difficult surgical exposure and high perioperative risks, endovascular intervention has emerged as the preferred treatment modality. Endovascular



**Figure 1:** **A)** Aneurysm of the right common iliac artery (indicated by the blue arrow). **B)** Aneurysmal dilation of the superior mesenteric artery (indicated by the green arrow), and aneurysm of the right renal artery (indicated by the blue arrow). **C)** Aneurysm of the splenic artery (indicated by the blue arrow). These illustrations address the question at hand.



**Figure 2:** **A)** Computed tomography angiography (CTA) of the patient showing a dissecting aneurysm of the right vertebral artery. **B, C)** Digital subtraction angiography and three-dimensional reconstruction images showing the dissecting aneurysm of the vertebral artery (indicated by the blue arrow). **D)** Workhorse view of stent-assisted embolization of the aneurysm. **E)** Intraoperative angiogram showing dense embolization of the aneurysm with the parent artery remaining patent, thereby addressing the question at hand. **F)** Postoperative magnetic resonance angiogram obtained at a 1-year follow-up showing no evidence of aneurysm recurrence.

treatment options for VBDA primarily include stent-assisted coil embolization, flow diverter implantation, and parent artery occlusion. Stent-assisted coil embolization involves placing a stent within the parent artery combined with coil embolization of the aneurysm, which effectively seals the aneurysm sac while maintaining patency of the parent artery (15). Flow diverters, such as the Pipeline embolization device, promote intra-aneurysmal thrombosis and vessel wall reconstruction through their dense mesh design, making them suitable for complex or giant aneurysms. In cases where preservation of the parent artery is not feasible, parent artery occlusion may be performed, provided that adequate collateral circulation is confirmed, to completely disrupt blood flow to the aneurysm.

## CONCLUSION

The management of TA complicated by aneurysms necessitates an individualized approach that integrates pharmacological therapy, surgical or endovascular interventions, and long-term follow-up. Early screening and proactive intervention are crucial for aneurysms with irregular morphology or high rupture risk to reduce the likelihood of aneurysm rupture and hemorrhage and improve patient outcomes.

## Declarations

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**Availability of data and materials:** The datasets generated and/or analyzed during the current study are available from the corresponding author by reasonable request.

**Disclosure:** The authors declare no competing interests.

**Ethical approval:** No IRC board approval was needed for this case report because the patient's identity was kept anonymous.

**Informed consent:** Informed written consent was acquired from the patient before the study.

## AUTHORSHIP CONTRIBUTION

Study conception and design: JC, ZS

Data collection: JC

Analysis and interpretation of results: CL, HW

Draft manuscript preparation: JC, HW

Critical revision of the article: LC

Other (study supervision, fundings, materials, etc...): JY

All authors (HW, JC, ZS, CL, JY, LC) reviewed the results and approved the final version of the manuscript.

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