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CASE REPORT

# Woven EndoBridge (WEB) Device used for Vertebral Artery Sacrifice

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## Introduction

The decision to sacrifice a vessel in the context of endovascular interventions arises from specific clinical indications where alternative treatments pose either higher risks or are simply not feasible. One critical indication is in the control of uncontrolled hemorrhage, particularly in cases of severe vascular trauma or bleeding situations. Additionally, sacrificing a vessel may be considered for managing aneurysms that are difficult to repair surgically or with other endovascular methods, especially if the affected vessel is already diseased and needs to be excluded from circulation. The decision to sacrifice a vessel should always be made in close consultation with a multidisciplinary team of vascular specialists with consideration of the individual patient's condition to ensure the best possible clinical outcome while minimizing potential complications.

The landscape of therapeutic options for patients presenting with acute subarachnoid hemorrhage (SAH) caused by ruptured vertebrobasilar dissecting aneurysms stems from multifaceted challenges. These aneurysms, nestled in critical anatomical locations, often exhibit intricate morphological characteristics and the potential involvement of pivotal arteries like the posterior inferior cerebellar artery (PICA) and anterior spinal artery (ASA). Moreover, vertebrobasilar dissecting aneurysms, if left untreated carry a 46% mortality risk [1]. Several studies found a significant rebleeding rate associated with these cases of around 71.4%, which exemplifies the critical need for prompt intervention [2]. Successfully navigating the treatment options for these lesions involves balancing endovascular strategies with the utilization of different neurovascular devices available in the market.

Not unlike Hunterian ligation, the use of coils for vessel sacrifice was widely adopted, with studies demonstrating treatment effectiveness complication avoidance such as aneurysm rupture [3]. Depending on a variety of factors including size of the vessel and the aneurysm, this can lead to the use of multiple coils, lead to longer procedure times, elevate the risk of thromboembolic complications, and increased overall costs. Some authors advocated the use of liquid embolic agents like Onyx in combination with coils to enhance the efficiency and cost effectiveness of vessel sacrifice [3]. In addition to the deconstructive techniques, the advent of flow diversion allowed otherwise prohibitive reconstructive approaches possible [4,5].

## Case Presentation

A 49-year-old female with a history of hypertension and arthritis presented with worsening headaches. She stated that she had a fall 2 weeks prior to admission while intoxicated. She has had persistent headaches since then, which worsened acutely the day before admission. Prior to admission, she stated that she had nausea and vomiting and was generally not feeling

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herself. Originally, she thought this was secondary to a pneumonia as headache and neck pain were symptoms she experienced when she was diagnosed previously with pneumonia. She was found by emergency medical services unresponsive after syncope. When she awoke, she had right lower extremity tingling, left-sided blurry vision, and nausea. Upon arrival at the hospital, her right lower extremity tingling improved and denied any focal weakness, but she had impaired left-sided vision and vomiting. The patient denied any regular blood thinner use or any relevant medical history. The patient endorses smoking about 1/3 of a pack per day, marijuana, and alcohol usage.

CTA imaging revealed a Hunt and Hess 2, Fisher 2 subarachnoid hemorrhage within the suprasellar region and posterior fossa, with a small volume of intraventricular hemorrhage. Imaging also showed a presumed ruptured left vertebral artery fusiform dissecting aneurysm measuring 4.5 mm and an unruptured left superior hypophyseal artery aneurysm measuring 3 mm. She underwent a diagnostic cerebral angiogram to further characterize and potentially treat the vascular anomalies seen on the initial CTA.

The diagnostic angiogram revealed codominant vertebral arteries, with a 4.5 mm ruptured left vertebral artery fusiform dissecting aneurysm extending approximately 20 mm in the V4 vertebral artery distal to the PICA origin (Figure 1A and Figure 1B). Additionally, it confirmed the presence of an unruptured left superior hypophyseal artery aneurysm measuring 3.26 × 2.3 mm, bilateral posterior communicating arteries with the left significantly larger than the right, a normal left P1 posterior cerebral artery, and a hypoplastic right P1 posterior cerebral artery.

Given the aneurysm rupture, the persistence of collateral flow from the anterior circulation through the posterior communicating arteries (PCOM), and the lack of feasible open surgical options, the decision was made to sacrifice the left vertebral artery. A 4.5 × 3 mm WEB device was deployed to occlude the vertebral artery proximal to, but not covering, the PICA origin. Two coils were then placed to complete the occlusion of the left vertebral artery. Post-procedure, the left PICA and all its branches were well visualized, filling from the contralateral vertebral artery (Figure 1C and Figure 1D). Aspirin 81 mg was administered to reduce the risk of stump embolization.

The patient tolerated the procedure well. She had an external ventricular drain (EVD) placed and was monitored in the ICU for two weeks following the subarachnoid hemorrhage. Repeat angiograms five days post-treatment showed no new angiographic changes and stable exclusion of the left vertebral artery and fusiform aneurysm. The patient was discharged home. Follow-up angiography at six months demonstrated stable occlusion of the left vertebral artery with an intact vertebrobasilar system, including the left posterior inferior cerebellar artery filling from the right vertebral artery injection.

## Discussion

This case highlights an innovative off-label use of coil-assisted WEB embolization, to treat a ruptured fusiform aneurysm of the left vertebral artery. Originally

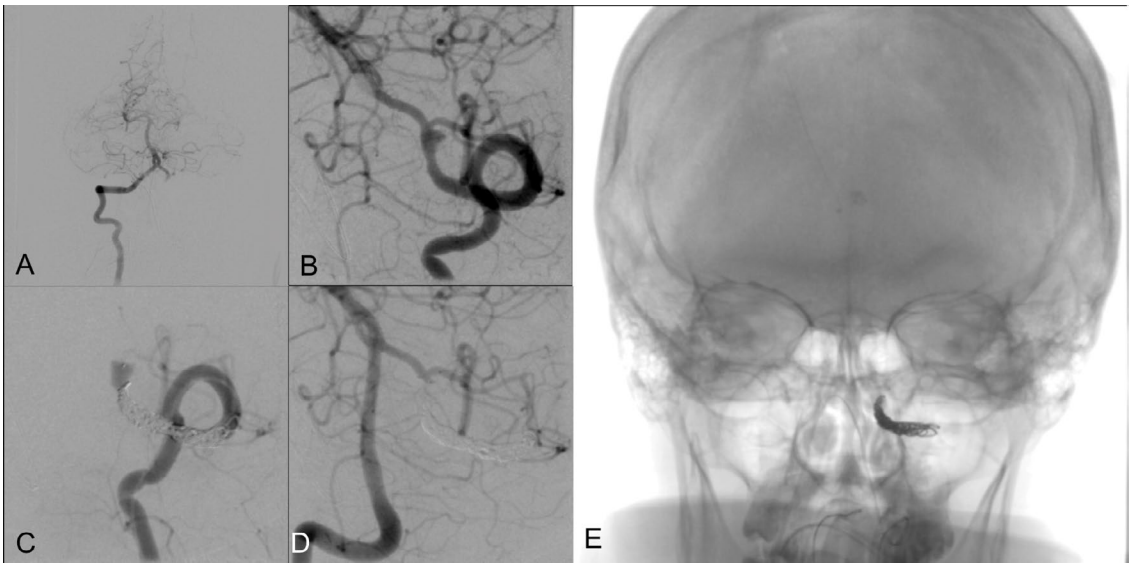


**Figure 1:** Diagnostic Cerebral Angiogram. (A) Right vertebral artery angiogram with crossing filling of the contralateral verbal artery filing to the left PICA; (B) 4.5 mm ruptured left vertebral artery fusiform dissecting aneurysm stretching 20 mm in the left vertebral artery distal to the PICA origin; (C) Left vertebral artery angiogram showing angiographic occlusion of the left vertebral artery sparing the LPICA origin with the use of WEB and coils; (D) Right vertebral artery angiogram showing the left PICA crossfilling from the right vertebral artery and angiographic occlusion of the left vertebral fusiform aneurysm; (E) Anterior/posterior native fluoroscopy showing the location of the WEB and coils in the proximal V4/ distal V3 vertebral segment.

designed for intrasaccular flow-disruption, WEB provides precise positioning with the risk of migration, or off-target embolization. While very effective, liquid embolic agents have the potential reflux, making precise occlusion more challenging and potentially leading to a higher number of thromboembolic complications. In contrast, when appropriately sized, the WEB device will maintain its position, allowing for a precise and controlled embolization.

The decision to sacrifice a vessel should always be carefully considered, bearing in mind the patient's condition and collateral circulation. In this case, the team evaluated the risks and benefits thoroughly before opting for a combination of the WEB device and coils as the suitable approach. One challenge in selecting devices for procedures in cases of acute subarachnoid hemorrhage (SAH) arises from limitations on using dual antiplatelet therapy. SAH patients often have an increased risk of bleeding complications and need extraventricular drain placement, which restricts their ability to receive antiplatelet medications for certain neurovascular devices, such as flow diverters or stents. This limitation significantly influences clinicians' choices as they must consider options that do not heavily rely on prolonged antiplatelet therapy.

## Conclusion

Choosing which endovascular device and technique becomes a balance, between ensuring effective treatment while minimizing the risk of clotting complications. This case highlights the significance of individualizing procedures and care in SAH cases to suit each patient's needs. A potential solution for treating artery dissection caused by a fusiform aneurysm may be in using intrasaccular devices such as the Woven EndoBridge (WEB) for vessel sacrifice during complex vascular interventions.

## Conflict of Interest Statement

We declare that we have no conflicting interests that could affect or be perceived to affect the integrity of our work, decisions, or recommendations related to this paper. Each member of our group confirms that they have no financial, personal, or professional relationships that could be seen as a conflict of interest in this context.

## Ethical/IRB Approval Statement

The IRB and Ethics committee at the University of Tennessee Health Science designate this case study as exempt requiring no IRB approval as it does not include any PHI and involved fewer than 5 cases.

## Author Contribution

All authors contributed to the drafting, critical revision, and editing of this manuscript.

## Use of Generative AI and AI-Assisted Technologies

During the preparation of this work the author(s) do not declare use of generative AI and AI-assisted technologies in the writing process.

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