

1 Vascular and Endovascular Neurosurgery

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►► Question 1

A 52-year-old female with a history of hypertension presents with a Hunt and Hess Grade II subarachnoid hemorrhage. Angiography reveals a 7-mm anterior communicating artery aneurysm with a wide neck. Which of the following treatment options should be considered first for this patient?

- A. Conservative management with serial imaging
- B. Endovascular coiling
- C. Microsurgical clipping
- D. Stereotactic radiosurgery
- E. Pharmacological therapy with antifibrinolytics

Correct answer is B

The decision between endovascular coiling and microsurgical clipping is influenced by several factors, including the aneurysm's size, location, morphology, and patient-specific factors. The International Subarachnoid Aneurysm Trial (ISAT) showed that in patients with ruptured intracranial aneurysms suitable for both coiling and clipping, endovascular coiling was associated with better outcomes in terms of survival free of disability at 1 year (► Table 1.1).

(A) **Conservative management with serial imaging** is generally not recommended for ruptured aneurysms due to the high risk of rebleeding, which can be catastrophic. (C) **Microsurgical clipping** involves craniotomy and the placement of a clip at the aneurysm's neck to isolate it from

blood flow. While effective, this method is more invasive and may pose a higher risk of complications for aneurysms that are difficult to access surgically or have complex anatomy. (D) **Stereotactic radiosurgery** does not play a role in the current management paradigm for cerebral aneurysms. (E) **Pharmacological therapy with antifibrinolytics** can be used temporarily to reduce the risk of early rebleeding before definitive treatment, but it is not a standalone treatment option for ruptured aneurysms.¹

►► Question 2

A 45-year-old man presents with a 1-year history of progressive lower extremity weakness and urinary incontinence. A spinal MRI shows a thoracic spinal dural arteriovenous fistula. Which of the following symptoms is most directly attributable to this condition?

- A. Cervical radiculopathy
- B. Lumbar disk herniation
- C. Myelopathic symptoms due to venous congestion
- D. Neurogenic claudication
- E. Peripheral neuropathy

Correct answer is C

Spinal dural arteriovenous fistulas (SDAVFs) are the most common type of spinal arteriovenous malformations (AVMs) and are a significant cause of adult myelopathy. They are characterized by an abnormal connection between a radicular artery and the radicular vein or the venous plexus of the spinal cord, leading to venous hypertension and congestion. This venous congestion can impair spinal cord function due to decreased perfusion and hypoxia, leading to progressive neurological symptoms such as weakness and sensory changes. The classification of spinal AVMs is summarized in ► Table 1.2.

The myelopathic symptoms due to venous congestion in SDAVFs are a direct result of venous hypertension that impairs spinal cord perfusion. This leads to a classic presentation of progressive lower extremity weakness, sensory changes, and bladder or bowel dysfunction. The symptoms typically worsen over time and can be exacerbated by activities that increase venous pressure, such as standing or exercise.

Table 1.1 Outcomes of endovascular coiling versus microsurgical clipping

Outcome	Endovascular coiling	Microsurgical clipping
Dead or dependent at 1 year	23.5%	30.9%
Rebleeding after initial treatment	Slightly higher risk	Lower risk
Epilepsy	Lower risk	Higher risk

Table 1.2 Classification of spinal AVMs

Type	Location	Characteristics	Clinical presentation
Type I—SDAVFs	Often thoracolumbar spine	Abnormal connection between a dural branch of a spinal artery and a radicular vein	Venous congestion and myelopathy
Type II—Intramedullary spinal cord AVMs (glomus AVMs)	Within the spinal cord, parenchyma	Compact nidus with direct arteriovenous shunting	Hemorrhage or myelopathy
Type III—Juvenile or giant AVMs	Extensive, involving much of the spinal cord and surrounding structures	High-flow lesions with multiple feeding arteries and dilated draining veins	Hemorrhage or severe neurological deficits
Type IV—Perimedullary AVMs	On the surface of the spinal cord	Direct fistulas between the feeding arteries and draining veins without a nidus	Subarachnoid hemorrhage or myelopathy

Abbreviations: AVMs, arteriovenous malformations; SDAVFs, spinal dural arteriovenous fistulas.

The diagnosis of SDAVFs typically involves spinal MRI to identify the signal changes associated with venous congestion and spinal angiography to identify the fistula definitively. Treatment usually involves endovascular embolization or surgical ligation of the fistula to prevent further venous congestion and potentially reverse some neurological deficits.²

►► Question 3

A 75-year-old man with a history of smoking and hypercholesterolemia presents with a transient ischemic attack characterized by right-sided weakness and aphasia. Carotid duplex ultrasound reveals 80% stenosis of the left internal carotid artery, confirmed on digital subtraction angiography (► Fig. 1.1). What is the most appropriate next step in management?

- A. Antiplatelet therapy
- B. Carotid endarterectomy
- C. Carotid stenting
- D. High-intensity statin therapy
- E. Lifestyle modifications

Correct answer is B

The decision for carotid endarterectomy (CEA) over other management strategies is supported by

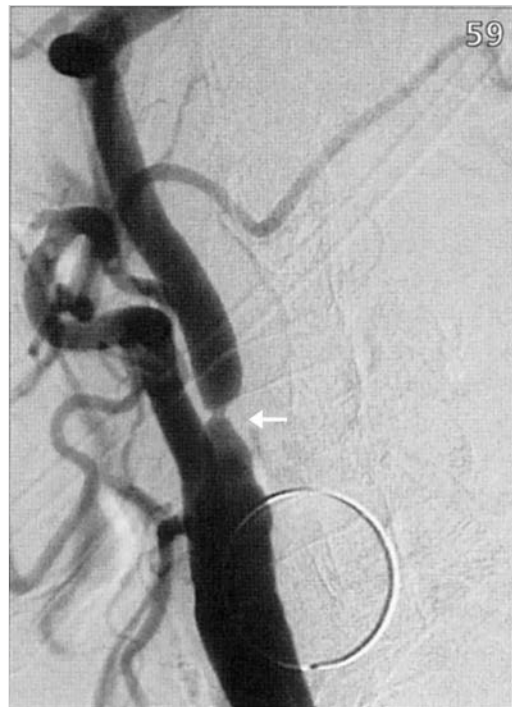


Fig. 1.1 (Source: Reproduced from *Ischemic Stroke*. In: Borsody M, ed. *Comprehensive Board Review in Neurology*. 2nd Edition. New York: Thieme; 2012.)

several key trials, which have demonstrated its effectiveness in reducing the risk of future strokes in patients with significant symptomatic carotid artery stenosis.

For a 75-year-old man with a history of smoking, hypercholesterolemia, and a recent transient ischemic attack, along with 80% stenosis of the left internal carotid artery, CEA is the most appropriate next step. This is based on evidence showing that CEA significantly reduces the risk of stroke in patients with symptomatic carotid stenosis by 70% or more. The key trials and their findings have been summarized in the table below. Additionally, studies such as the CREST trial demonstrated improved outcomes in patients older than 70 years with CEA compared to carotid stenting.

Patient selection is key, and (C) **Carotid stenting** may be preferred for the treatment of carotid stenosis in patients younger than 70 years and with significant cardiac medical history.

(A) **Antiplatelet therapy**, (D) **High-intensity statin therapy**, and (E) **Lifestyle modifications** are

essential components of the management strategy for patients with carotid artery disease but, in this case, do not address the immediate risk of stroke as effectively as CEA for symptomatic high-grade stenosis (► Table 1.3).^{3,4,5,6,7}

►► Question 4

A 32-year-old woman on oral contraceptives presents with headache, papilledema, and seizures. MRV shows thrombosis in the superior sagittal sinus. Which of the following is the initial treatment of choice?

- A. Acetazolamide
- B. Anticoagulation with heparin
- C. Decompressive craniectomy
- D. Endovascular thrombectomy
- E. High-dose corticosteroids

Correct answer is B

Dural venous sinus thrombosis (DVST) can be precipitated by several factors, including oral

Table 1.3 Key findings of carotid endarterectomy and stenting trials

Trial name	Year	Comparison	Key findings	Citations
NASCET	1991	CEA vs. medical therapy	CEA significantly reduced the risk of ipsilateral stroke in patients with symptomatic carotid stenosis of 70–99%	Barnett HJM, Taylor DW, Haynes RB, et al. <i>N Engl J Med</i> 1991;325(7):445–453
ECST	1998	CEA vs. medical therapy	CEA offered significant stroke prevention benefits over medical treatment in patients with symptomatic high-grade carotid artery stenosis	European Carotid Surgery Trialists' Collaborative Group. <i>Lancet</i> 1998;351(9113):1379–1387
ACST	2004	CEA vs. medical therapy (asymptomatic)	CEA reduces the risk of stroke in asymptomatic patients, especially in men and those over 75 years	Halliday A, Mansfield A, Marro J, et al. <i>Lancet</i> 2004;363(9420):1491–1502
SAPPHIRE	2004	CAS vs. CEA (high-risk patients)	CAS was noninferior to CEA in patients at high risk for surgical complications	Yadav JS, Wholey MH, Kuntz RE, et al. <i>N Engl J Med</i> 2004;351(15):1493–1501
CREST	2010	CEA vs. CAS	CEA and CAS were effective for carotid revascularization in symptomatic and asymptomatic patients with different risk profiles. Patients older than 70 fared better with CEA. The risk of stroke was higher in CAS. The risk of MI was higher in CEA	Brott TG, Hobson RW II, Howard G, et al. <i>N Engl J Med</i> 2010;363(1):11–23

contraceptive use, which is likely relevant in the case of the 32-year-old woman described. **(B) Anticoagulation with heparin** is the initial treatment of choice for DVST, regardless of intracranial hemorrhage. This approach aims to stop the clot from growing and prevent new clots from forming, allowing the body's natural fibrinolytic mechanisms to dissolve the existing clot. Anticoagulation therapy typically starts with intravenous heparin, followed by transition to oral anticoagulants.

(A) Acetazolamide reduces cerebrospinal fluid production and can help relieve symptoms associated with increased intracranial pressure, but it does not address the underlying cause of DVST. **(C) Decompressive craniectomy** may be considered in cases where there is evidence of significant brain edema or venous infarct leading to a risk of herniation or when medical therapy fails to control increased intracranial pressure. It is a more invasive option and not the first line of treatment. **(D) Endovascular thrombectomy** may be an option in some instances where there is a large or extensive thrombus causing significant venous obstruction, mainly if there is a poor response to medical therapy. However, it is not typically the initial treatment choice. **(E) High-dose corticosteroids** have been used to reduce cerebral edema in CVST, but their efficacy is controversial, and they are not considered a first-line treatment.^{8,9}

►► Question 5

A 39-year-old female, 3 days post-ruptured middle cerebral artery aneurysm repair, develops a worsening headache and confusion. Transcranial Doppler shows increased flow velocities. Which of the following should be the next step in the treatment for suspected cerebral vasospasm?

- A. Calcium channel blockers
- B. Corticosteroids
- C. Hyperbaric oxygen therapy
- D. Increased fluid administration and induction of hypertension
- E. Intravenous magnesium sulfate

Correct answer is D

Upon detection of cerebral vasospasm following aneurysmal subarachnoid hemorrhage (SAH), as evidenced by clinical symptoms and increased flow velocities on transcranial Doppler, the active

intervention aims to alleviate the vasospasm and improve cerebral perfusion. The traditional triple H therapy (hypervolemia, hypertension, hemodilution) seeks to enhance blood flow to ischemic brain regions affected by the vasospasm. The central component of this therapy, particularly for symptomatic vasospasm, is induced hypertension, facilitated by vasopressors to elevate systemic blood pressure and drive blood flow through the narrowed vessels.

While there has been a move toward more nuanced management strategies in recent years, induced hypertension remains a cornerstone for treating symptomatic cerebral vasospasm, supported by clinical experience and expert consensus. The American Heart Association/American Stroke Association (AHA/ASA) guidelines for the management of aneurysmal subarachnoid hemorrhage recommend the use of hemodynamic augmentation, including induced hypertension, for patients with symptomatic vasospasm, despite the specific mention of triple H therapy being less emphasized in recent guidelines due to potential complications associated with hypervolemia and hemodilution.

(A) Calcium channel blockers (nimodipine), while not directly reversing established vasospasm, play a crucial prophylactic role in reducing the risk of delayed cerebral ischemia (DCI) by preventing calcium influx into smooth muscle cells of the vessel wall. **(E) Intravenous magnesium sulfate** and **(B) Corticosteroids** have been explored for their potential benefits in vasospasm management; however, clinical trials and current evidence do not support their effectiveness in this specific context, with magnesium sulfate showing no significant benefit, and corticosteroids not being recommended due to a lack of efficacy in treating vasospasm. **(C) Hyperbaric oxygen therapy**, aiming to increase oxygen delivery to ischemic brain tissue, presents an interesting approach, yet it remains a nonstandard treatment with limited evidence supporting its use in cerebral vasospasm.^{10,11,12,13,14,15}

►► Question 6

A 60-year-old man presents with a sudden onset of headache, nausea, and left-sided weakness. Noncontrast CT of the head reveals a right basal ganglia hemorrhage with intraventricular extension and no clinical signs of hydrocephalus



Fig. 1.2 (Source: Reproduced from Clinical presentation. In: Riascos R, Bonfante E, Calle S, eds. RadCases Plus Q 2018.)

(► Fig. 1.2). Which of the following is the most appropriate initial management?

- A. Immediate anticoagulation
- B. Surgical evacuation of the hematoma
- C. Conservative management with blood pressure control
- D. Intraventricular fibrinolysis
- E. Ventriculostomy

Correct answer is C

In the scenario of a 60-year-old man presenting with sudden-onset headache, nausea, and left-sided weakness, where noncontrast CT of the head reveals a right basal ganglia hemorrhage with intraventricular extension and no evidence of ventriculomegaly or clinical hydrocephalus, the most appropriate initial management is conservative treatment focusing on blood pressure control. This approach aims to stabilize the patient's condition, mitigate the risk of hematoma expansion, and manage symptoms while minimizing potential complications.

(B) **Surgical evacuation of the hematoma** might be considered in specific circumstances, such as when the hematoma is accessible and

causing significant mass effect. Specifically, the size and location of the hematoma governs surgical evacuation. Larger hematomas, especially those greater than 30cm³ in volume, located superficially within 1 cm of the cortical surface, may benefit from surgical evacuation, particularly if the patient's neurological status is deteriorating due to mass effect from the hematoma. (D) **Intraventricular fibrinolysis** may be utilized in cases where there is significant intraventricular hemorrhage leading to hydrocephalus. While this approach can help alleviate hydrocephalus by breaking down blood clots in the ventricles, it is not typically the first line of management for basal ganglia hemorrhage without significant ventricular involvement. In the setting of hydrocephalus, (E) **Ventriculostomy** should be performed for cerebrospinal fluid diversion and intracranial pressure management.^{16,17}

►► Question 7

A 7-year-old child presents with recurrent transient ischemic attacks affecting the right side. Angiography shows stenosis of the bilateral internal carotid arteries with a “puff-of-smoke” appearance (► Fig. 1.3). Which of the following surgical treatments is most appropriate?

- A. Carotid endarterectomy
- B. Direct superficial temporal artery to middle cerebral artery bypass

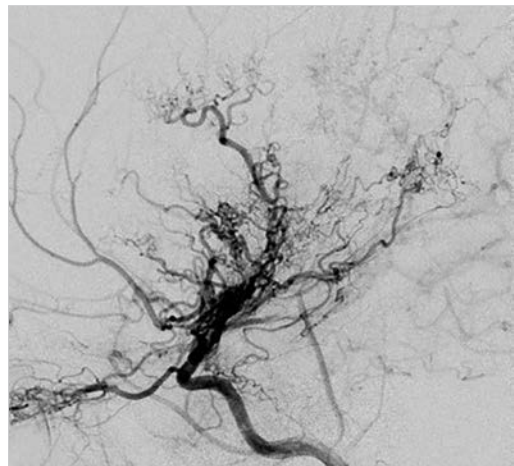


Fig. 1.3 (Source: Reproduced from Moyamoya syndrome and disease. In: Theodore N, Lonser R, eds. The Brain, Spine and Nerves in Sports. 1st ed. New York: Thieme; 2024.)

- C. Endovascular stenting of the internal carotid arteries
- D. Encephaloduroarteriosynangiosis (EDAS)
- E. Vertebral artery angioplasty

Correct answer is B

A 7-year-old child presenting with recurrent transient ischemic attacks affecting the right side and showing angiographic evidence of bilateral internal carotid artery stenosis with a “puff-of-smoke” appearance is indicative of Moyamoya disease. This condition is characterized by progressive stenosis of the intracranial internal carotid arteries and their main branches, with the development of an abnormal vascular network at the base of the brain compensating for the stenosis.

Grading of Moyamoya disease:

Moyamoya disease is staged based on angiographic findings and according to the Suzuki stages, ranging from Grade I (incipient stage with narrowing of the carotid fork) to Grade VI (most severe stage with disappearance of the Moyamoya network and reliance on external carotid artery for blood supply). They are summarized in ► Table 1.4.

(B) **Direct superficial temporal artery to middle cerebral artery bypass** involves the anastomosis between the harvested donor vessel (superficial temporal artery) and the cortical recipient vessel (middle cerebral artery, M4), and it offers an immediate boost in collateral blood flow. Studies have shown that direct bypass can offer more immediate symptomatic relief and a lower

risk of perioperative stroke in Moyamoya patients with significant ischemic symptoms. (D) **Encephaloduroarteriosynangiosis (EDAS)**: Indirect revascularization techniques, such as EDAs, involve laying a donor artery on the surface of the brain to encourage new blood vessel growth over time. While these procedures are less invasive and can be effective, they typically take longer to establish improved blood flow and may not be sufficient for patients with severe or rapidly progressing symptoms. The choice between direct and indirect bypass in Moyamoya disease is informed by several factors, including the patient’s age, severity of symptoms, specific characteristics of cerebral blood flow compromise, and size and quality of the potential recipient and donor vessels. (A) **Carotid endarterectomy**, (C) **Endovascular stenting of the internal carotid arteries**, and (E) **Vertebral artery angioplasty** do not play a role in the management of Moyamoya disease.^{18,19}

►► **Question 8**

A 55-year-old male with a known glioblastoma multiforme presents with acute onset of hemiparesis. MRI brain shows a new area of restricted diffusion adjacent to the tumor site. Which of the following is the most likely cause of this finding?

- A. Radiation necrosis
- B. Tumor progression
- C. Postsurgical changes
- D. Tumor-associated stroke
- E. Chemotherapy-induced leukoencephalopathy

Table 1.4 Grading of Moyamoya disease

Grade	Description
I	Narrowing of the carotid bifurcation
II	Initiation of the Moyamoya network at the base of the brain (initial Moyamoya blush)
III	Intensification of the Moyamoya network (increased blush), loss of proximal ACA and MCA, leptomeningeal collaterals from PCA
IV	Minimization of the Moyamoya network (reduced blush), progressive ICA occlusion, with the development of ECA collateral routes
V	Reduction of the Moyamoya network (reduced blush) and increased prominence of ECA collaterals
VI	Disappearance of the Moyamoya network and full reliance on ECA for blood supply

Abbreviations: ACA, anterior cerebral artery; ECA, external carotid artery; ICA, internal carotid artery; MCA, middle cerebral artery; PCA, posterior cerebral artery.

Correct answer is D

This type of stroke can occur in patients with high-grade gliomas due to several tumor-related factors, including vascular endothelial proliferation, increased intracranial pressure leading to compromised blood flow, and the propensity of these tumors to invade or compress adjacent blood vessels.

(A) **Radiation necrosis** is a delayed complication of radiation therapy that typically occurs months to years after treatment. While it can mimic tumor progression on imaging, its onset is generally not associated with acute neurological deficits like hemiparesis without preceding signs. (B) **Tumor progression** could explain new neurological symptoms and imaging changes, but the specific finding of restricted diffusion on MRI is more indicative of acute ischemia than of tumor growth alone. (C) **Postsurgical changes** can include a variety of findings on MRI, depending on the extent and location of surgery. While surgery can lead to changes in brain structure and function, an acute onset of hemiparesis and restricted diffusion on MRI are more suggestive of an acute vascular event. (E) **Chemotherapy-induced leukoencephalopathy** typically presents with more diffuse changes on MRI and a more gradual onset of neurological symptoms, rather than acute hemiparesis and localized restricted diffusion.^{20,21}

►► Question 9

A 70-year-old man develops a sudden onset of paraplegia following thoracoabdominal aneurysm repair. Which of the following is the most likely cause?

- A. Acute herniated lumbar disk
- B. Spinal cord ischemia due to artery of Adamkiewicz occlusion
- C. Postoperative hematoma compressing the spinal cord
- D. Acute epidural abscess
- E. Neurogenic shock

Correct answer is B

The artery of Adamkiewicz is a critical blood vessel that supplies blood to the lower two-thirds of the spinal cord, including the lumbar and sacral regions. During thoracoabdominal aneurysm repair, inadvertent damage or occlusion of this artery can lead to a significant reduction in blood flow to the spinal cord, resulting in ischemia and subsequent paraplegia.

(A) **Acute herniated lumbar disk** typically presents with radicular pain and possible weakness in the lower extremities, but sudden paraplegia immediately following surgery suggests a vascular rather than mechanical cause. (C) **Postoperative hematoma compressing the spinal cord** is a possible cause of acute neurological deterioration postsurgery, but this condition would likely be identifiable on imaging studies and might not present as abruptly as ischemia. (D) **Acute epidural abscess** generally develops over a longer period and is associated with infection signs, making it less likely in the immediate postoperative period without preceding infection. (E) **Neurogenic shock** can occur after spinal cord injury but is characterized by hypotension and bradycardia, alongside potential motor and sensory deficits, not isolated acute paraplegia.^{22,23}

► Fig. 1.4 shows a diagram illustrating the spinal cord's blood supply, highlighting the artery of Adamkiewicz.

►► Question 10

A 10-year-old child presents with sudden severe headache and loss of consciousness. Imaging reveals a ruptured cerebral aneurysm. Which of the following factors is most commonly associated with pediatric cerebral aneurysms?

- A. Atherosclerosis
- B. Connective tissue disorders
- C. Hypertension
- D. Smoking
- E. Diabetes mellitus

Correct answer is B

In pediatric patients, cerebral aneurysms are relatively rare compared to the adult population and often have different underlying causes. Among these, **connective tissue disorders** are the most commonly associated factor with the development of cerebral aneurysms in children. These disorders, which include conditions like Marfan syndrome, Ehlers-Danlos syndrome, and others, can lead to weaknesses in the blood vessel walls, making them more prone to bulging and aneurysm formation.

(A) **Atherosclerosis** is uncommon in children due to the shorter exposure time to risk factors that contribute to atherosclerotic changes, and while it may contribute to cerebral aneurysm formation, it is not a leading cause. (C) **Hypertension** is a significant risk factor for aneurysm development, particularly in adulthood, and can

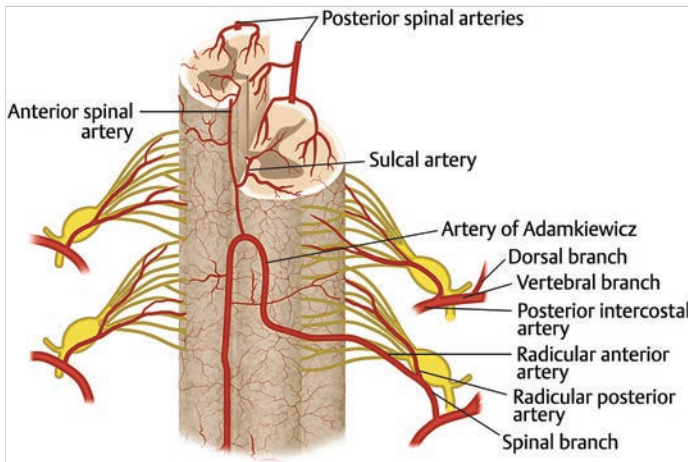


Fig. 1.4 (Source: Reproduced from 5.4 Muscular anatomy. In: Singh K, ed. Spine Essentials Handbook: A Bulleted Review of Anatomy, Evaluation, Imaging, Tests, and Procedures. 1st ed. New York: Thieme; 2019.)

contribute to aneurysm formation by increasing the stress on blood vessel walls. However, it is less commonly the primary factor in pediatric cases compared to connective tissue disorders. **(D) Smoking** is a well-established risk factor for the development of aneurysms in adults but is unlikely to be a significant factor in pediatric populations due to less exposure. **(E) Diabetes mellitus** is associated with vascular complications over time but is not directly linked to the formation of cerebral aneurysms, especially in pediatric cases.^{24,25}

►► Question 11

For a patient with a saccular middle cerebral artery aneurysm measuring 6 mm in diameter and a 3-mm neck, which of the following endovascular treatments is most appropriate?

- A. Flow diversion
- B. Coiling
- C. Stenting
- D. Balloon angioplasty
- E. Conservative management with observation

Correct answer is B

Endovascular coiling is a preferred treatment for small saccular middle cerebral artery aneurysms with favorable aspect ratios, providing a safe and effective means of preventing rupture. The decision-making process involves careful consideration of aneurysm morphology, including size, neck width, and aspect ratio, to determine the most appropriate treatment approach and the

potential need for adjunctive techniques. Of note, recent endovascular innovations, such as intrasaccular flow diverting devices (the WEB), have emerged as a possible treatment option for cerebral aneurysms with favorable configurations.

Aspect Ratios of Aneurysms:

The aspect ratio, which is the height of the aneurysm dome divided by the neck width, is a crucial morphological feature in determining the suitability of an aneurysm for coiling and the likelihood of requiring adjunctive techniques. A higher aspect ratio indicates a more favorable geometry for coiling. An aspect ratio of < 1.6 often predicts the need for adjunctive techniques such as balloon or stent assistance to secure the coils within the aneurysm. Aneurysms with an aspect ratio of < 1.2 almost always require these adjunctive techniques for successful coiling.

Wide-Neck Cerebral Aneurysm:

A wide-neck cerebral aneurysm is most commonly defined by a neck diameter of ≥ 4 mm or a dome-to-neck ratio of < 2 . These morphologic features make endovascular treatment more challenging due to the increased risk of coil herniation into the parent vessel. In such cases, adjunctive techniques or alternative treatments may be considered.

(A) Flow diversion and **(C) Stenting** are typically reserved for aneurysms that are not suitable for coiling due to their size, shape, or neck width. Flow diverters are particularly useful for larger aneurysms with wide necks. **(D) Balloon angioplasty** is not a primary treatment for aneurysms but may be used adjunctively to remodel the

vessel or assist in coiling. (E) **Conservative management with observation** is generally considered for small aneurysms (<7mm) that are incidentally found and have a low risk of rupture, depending on the patient's overall risk profile and aneurysm characteristics (► Fig. 1.5).^{26,27}

►► Question 12

A patient presents with vertigo, dysphagia, hoarseness, and hiccups. MRI shows a stroke in the lateral medulla. Which artery is most likely occluded?

- A. Anterior inferior cerebellar artery
- B. Posterior inferior cerebellar artery (PICA)
- C. Superior cerebellar artery
- D. Basilar artery
- E. Vertebral artery

Correct answer is B

A patient presenting with vertigo, dysphagia, hoarseness, and hiccups, coupled with an MRI showing a stroke in the lateral medulla, is

highly indicative of occlusion of the **posterior inferior cerebellar artery (PICA)**. These symptoms are classic for lateral medullary syndrome (also known as Wallenberg's syndrome), which is most commonly caused by the occlusion of PICA.

(A) **Anterior inferior cerebellar artery (AICA)** typically presents with symptoms that can include hearing loss and facial weakness, due to its supply area involving the inner ear and facial nerve. (C) **Superior cerebellar artery** occlusion would more likely affect coordination and movement, given its supply to the upper part of the cerebellum. (D) **Basilar artery** involvement often leads to more widespread brainstem symptoms due to its larger territory, potentially including severe motor and consciousness disturbances. (E) **Vertebral artery** could be a broader answer that might encompass PICA since PICA branches off the vertebral artery. However, the specificity of the symptoms and the area of the brain affected as shown on MRI directly point to PICA as the most precise answer.^{28,29}

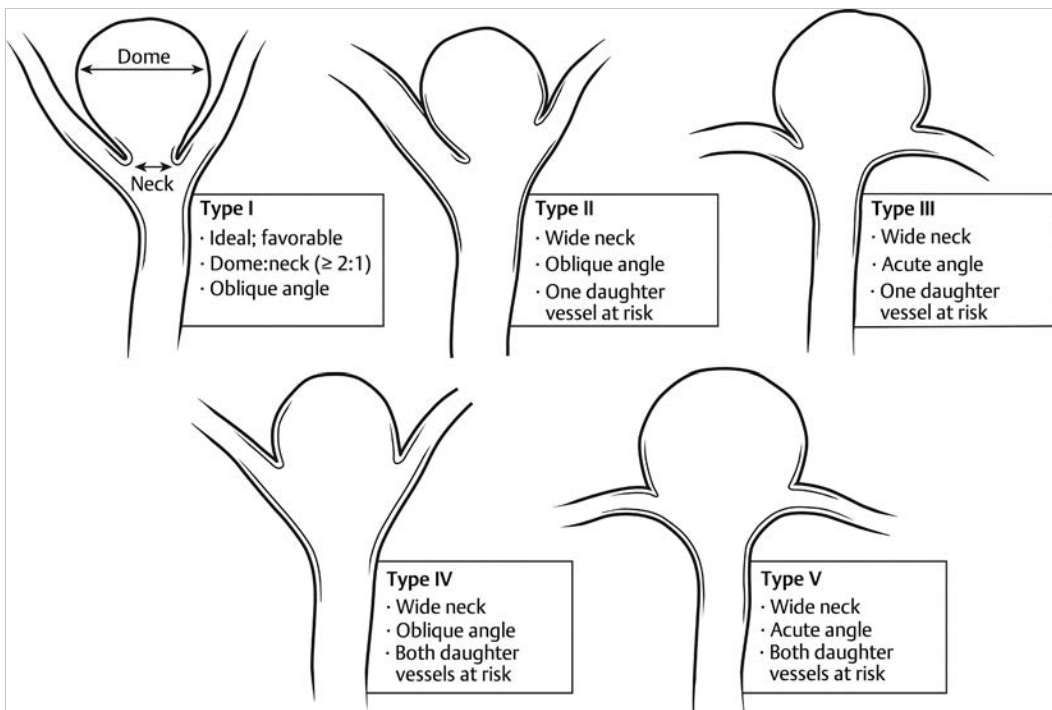


Fig. 1.5 (Source: Reproduced from Type I: Favorable dome-to-neck ratio ($\geq 2:1$). In: Spetzler R, Kalani M, Nakaji P, ed. Neurovascular Surgery. 2nd ed. New York: Thieme; 2015.)

►► Question 13

A 45-year-old male presents with headache, cognitive decline, and multifocal neurologic deficits. Brain biopsy confirms primary CNS vasculitis. What is the mainstay of treatment?

- A. Anticoagulation
- B. Corticosteroids and cyclophosphamide
- C. Surgical resection of lesions
- D. Endovascular angioplasty
- E. High-dose aspirin

Correct answer is B

The treatment of primary CNS vasculitis focuses on rapidly controlling inflammation and modulating the immune response to prevent further vessel damage and neurological compromise.

(A) **Anticoagulation** is not typically used as the primary treatment for primary CNS vasculitis because the core problem is inflammation of the vessel wall rather than blood clotting. However, it may be considered in certain situations if there is a specific risk of thrombosis. (C) **Surgical resection of lesions** is not applicable in this context because primary CNS vasculitis is a diffuse process affecting multiple blood vessels rather than a single, resectable lesion. (D) **Endovascular**

angioplasty is not a standard treatment for primary CNS vasculitis, as the disease involves inflammation and potential damage to the vessel walls rather than blockages that can be opened with angioplasty. (E) **High-dose aspirin** is used in various vasculitides for its anti-inflammatory properties, but it is not sufficient as the mainstay therapy for primary CNS vasculitis, where more potent immunosuppressive therapy is required.^{30,31}

►► Question 14

A 55-year-old man presents with progressive myelopathy. MRI and spinal angiography confirm a spinal dural arteriovenous fistula (DAVF) at the L2 level (► Fig. 1.6). Of the following, what is the most appropriate treatment?

- A. Observation and physical therapy
- B. High-dose corticosteroids
- C. Laminectomy and fistula ligation
- D. Systemic anticoagulation
- E. Radiation therapy

Correct answer is C

Surgical treatment, specifically laminectomy and fistula ligation, is the most effective approach for managing spinal dural arteriovenous fistulas,

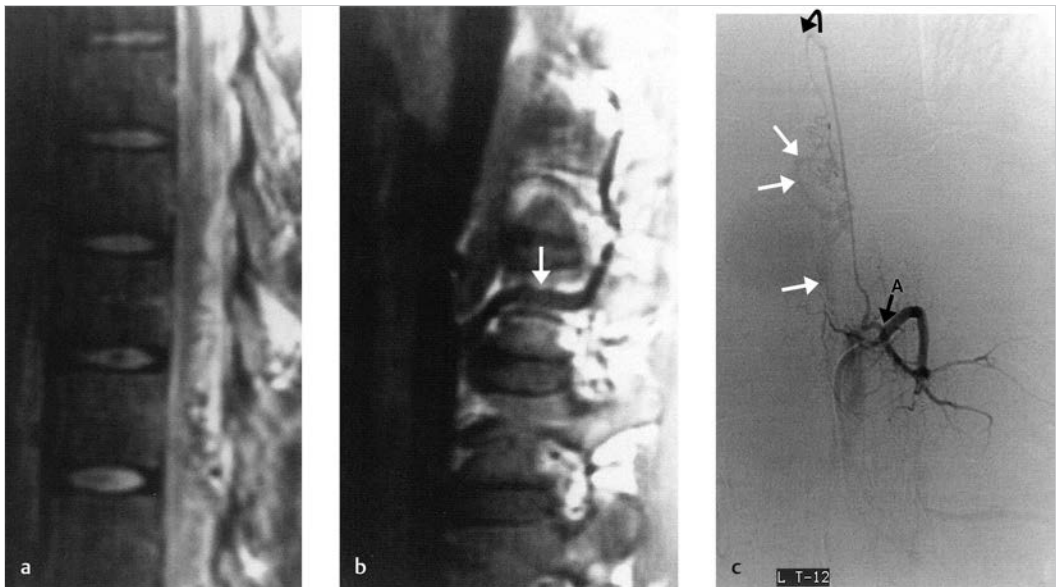


Fig. 1.6 (Source: Reproduced from XXV. Spinal vascular diseases. In: Citow J, Macdonald R, Puffer R, Khalid S, Carter B, Cohen A, Spinner R, Refai D, eds. *Comprehensive Neurosurgery Board Review*. 3rd ed. New York: Thieme; 2019.)