

Intracranial dural arteriovenous fistula

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General information

AKA [dural AVMs](#) (DAVM). Vascular abnormality in which an [arteriovenous shunt](#) is contained within the leaflets of the [dura mater](#), exclusively supplied by branches of the internal/[external carotid artery](#) or vertebral arteries ¹⁾.

Because they are considered acquired rather than [congenital](#) lesions, the term [fistula](#) is preferred over [malformation](#), although the latter term has also been used in the literature.

Multiple fistulas may be found in up to 8% of cases.

Usually found adjacent to [dural venous sinuses](#).

Common locations:

1. transverse/sigmoid: the most common ²⁾ (63% of cases) with a slight left-sided predominance, ³⁾ with the epicenter of these almost invariably at the junction of the transverse and [sigmoid sinuses](#)
2. tentorial/petrosal
3. anterior fossa/ethmoidal
4. [middle fossa](#)/Sylvian
5. [cavernous sinus](#) (carotid-cavernous fistula—CCF)
6. [Superior sagittal sinus dural arteriovenous fistula](#)
7. [foramen magnum](#)

[Dural arteriovenous fistulas](#) are abnormal connections of [dural artery](#) to [dural veins](#) or [venous sinuses](#) originating from within the dural leaflets. They are usually located near or within the wall of a [dural venous sinus](#) that is frequently obstructed or stenosed. The dural fistula sac is contained within the dural leaflets, and drainage can be via a [dural sinus](#) or retrograde through [cortical veins](#) (leptomeningeal drainage).

The dura propria faces the surface of brain, and the osteal dura faces the bone. The location of the shunt points is not distributed homogeneously on the surface of the dural membrane, but there are certain areas susceptible to DAVFs. The dura mater of the olfactory groove, falx cerebri, inferior sagittal sinus, tentorium cerebelli, and falx cerebelli, and the dura mater at the level of the spinal cord are composed only of dura propria, and these areas are derived from neural crest cells. The dura mater of the cavernous sinus, transverse sinus, sigmoid sinus, and anterior condylar confluence surrounding the hypoglossal canal are composed of both dura propria and osteal dura; this group is

derived from mesoderm. Although the cause of this heterogeneity has not yet been determined, there are some specific characteristics and tendencies in terms of the embryological features. The possible reasons for the segmental susceptibility to DAVFs are summarized based on the embryology of the dura mater ⁴⁾.

Classification

[Intracranial dural arteriovenous fistula classification.](#)

Etiology

Evidence suggests that most DAVFs are acquired, idiopathic lesions, and they have a well-recognized association with venous sinus thrombosis, although their exact pathogenesis is not fully understood.

Theories include:

1. venous sinus occlusion awakens dormant embryonic dural arteriovenous channels ⁵⁾.
2. venous hypertension/thrombosis promotes local angiogenesis and the de novo formation of DAVF ⁶⁾.
3. the DAVF may arise first and itself result in venous sinus thrombosis ⁷⁾.

Unresected venous drainage of an [AVM](#) might be the substratum for neo-angiogenetic processes; moreover [inflammation](#) related to surgery might be the trigger factor for the development of the [dural arteriovenous fistula](#) ⁸⁾.

Pathogenesis

The results of recent clinical and experimental studies suggest that the most important factor associated with the pathogenesis of dural arteriovenous fistula (AVF) is sinus thrombosis and subsequent venous or intrasinus hypertension ⁹⁾.

Natural History

The natural history of cranial dural arteriovenous malformations (AVM's) is highly variable.

Awad et al., present their clinical experience with 17 dural AVM's in adults, including 10 cases with an aggressive neurological course (strictly defined as hemorrhage or progressive focal neurological deficit other than ophthalmoplegia). Two of these 10 patients died prior to surgical intervention and a third was severely disabled by intracerebral hemorrhage. Six patients underwent surgical resection of their dural AVM, with preparatory embolization in two cases. One patient received embolization and

radiation therapy without surgery. Six of the seven cases without an aggressive neurological course were treated conservatively, and the seventh patient underwent embolization of a cavernous sinus dural AVM because of worsening ophthalmoplegia. In order to clarify features associated with aggressive behavior, a comprehensive meta-analysis was performed on 360 additional dural AVM's reported in the literature with sufficiently detailed clinical and angiographic information. The location and angiographic features of 100 aggressive cases were compared to those of 277 benign cases. No location of dural AVM's was immune from aggressive neurological behavior; however, an aggressive neurological course was least often associated with cases involving the transverse-sigmoid sinuses and cavernous sinus and most often associated with cases at the tentorial incisura. Contralateral contribution to arterial supply and rate of shunting (high vs. low flow) did not correlate with aggressive neurological behavior as defined. Leptomeningeal venous drainage, variceal or aneurysmal venous dilations, and galenic drainage correlated significantly (p less than 0.05) with aggressive neurological presentation. The latter three angiographic features often coexisted in the same dural AVM. It is concluded that these features significantly increase the natural risk of dural AVM's, and warrant a more vigilant therapeutic strategy¹⁰⁾.

Clinical Features

[Intracranial dural arteriovenous fistula clinical features.](#)

Diagnosis

[Intracranial dural arteriovenous fistula diagnosis.](#)

Treatment

[Intracranial dural arteriovenous fistula treatment.](#)

Complications

Non-traumatic [subdural hematoma](#) (SDH) caused by [dural arteriovenous fistula](#) (DAVF) is rare and is usually accompanied by [intracerebral hemorrhage](#) (ICH) and/or [subarachnoid hemorrhage](#) (SAH).

Dural arteriovenous fistula (AVF) presenting with [subdural hematoma](#) is relatively rare.

Case series

[Intracranial dural arteriovenous fistula case series.](#)

Case reports

[Intracranial dural arteriovenous fistula case reports.](#)

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