



## Neurovascular Service: Carotid-Cavernous Fistula

Carotid-cavernous fistulas are a specific type of abnormal connection of the arteries directly into the venous system. Patients present with proptosis, ecchymosis (redness), and pain around the affected eye. Patients may have double vision as the nerves that control the eye are affected or vision loss from pressure in the eye itself. These symptoms are a result of increased blood flow and pressure from the arteries to the veins in this region. There are two types of abnormal connection:

- » Direct fistulas are usually caused by injury to the internal carotid artery. Blood flow is shunted directly into the cavernous sinus and then into the superior and/or inferior ophthalmic veins.
- » Indirect fistulas are caused by abnormal channels connecting the internal carotid artery or other arterial branch to the cavernous sinus with outflow into the ophthalmic veins.

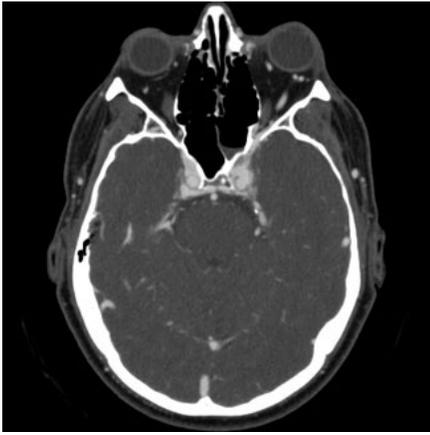
It is important to treat this group of patients quickly to avoid compromise of vision, as venous pressure will eventually lead to blindness. Treatment is accomplished by endovascular closure the fistula. This is a done under general anesthesia. A sheath is placed in the femoral artery in the groin, and a diagnostic catheter is used to obtain a cerebral angiogram. Treatment options may include occlusion of a direct connection from the internal carotid artery and cavernous sinus or closure of the cavernous sinus with detachable platinum coils and or liquid embolic agents. Balloon assisted reconstruction or an artery or stent may be considered. For some lesions, access to the venous side such as the facial vein or a cut down approach to the superior ophthalmic vein may be used. In some patients the internal carotid artery may need to be occluded in order to trap the lesion. Patients are usually followed in the Neuro-intensive care unit a few days. Specialty services involved in the care of these patients may include the Neurosurgery, Neurology and Neuro-ophthalmology.

**Interventional Neuroradiology Program, Neurovascular Service**

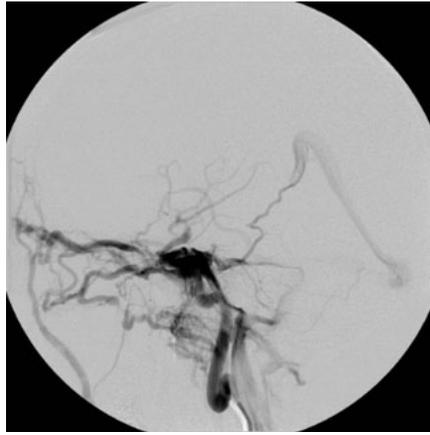
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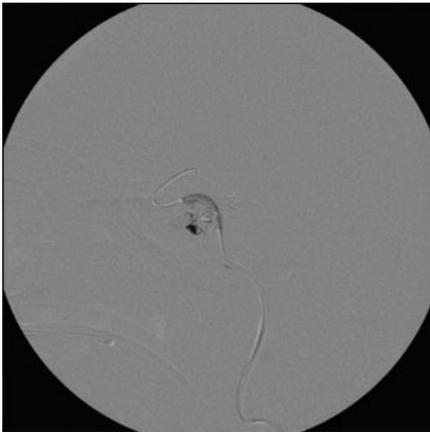
CT scan shows proptosis of the left globe with enlargement of the inferior ophthalmic vein.



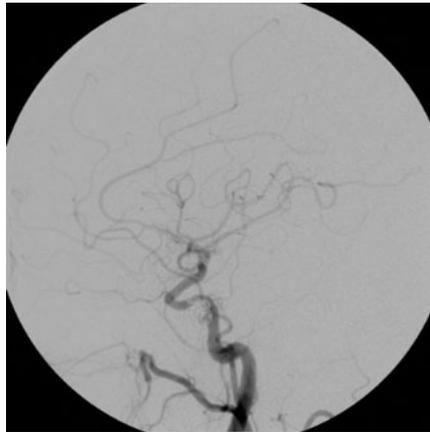
Lateral carotid angiogram shows a direct fistula from the left internal carotid artery to the cavernous sinus. There is outflow into the ophthalmic veins and cortical veins.



Roadmap angiogram shows disconnection of flow into the cortical vein with coil placement.



A second roadmap angiogram shows balloon remodeling technique used for coil placement in the right cavernous sinus.



Final lateral angiogram shows reconstruction of the left carotid artery and closure of the direct carotid cavernous fistula.

*The Neurovascular Service at Massachusetts General Hospital provides a multidisciplinary approach to patient care that combines neurosurgery, neurology and interventional neuroradiology. Based in the Department of Radiology, the Neurovascular Service's Interventional Neuroradiology Program uses minimally invasive procedures to treat a range of neurovascular disease and spinal disorders. For more information, visit [www.mgh-interventional-neurorad.org](http://www.mgh-interventional-neurorad.org)*

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