Carotid cavernous fistula embolization

see Carotid cavernous fistula transvenous embolization.

The treatment goal is to eliminate the carotid cavernous fistula.

Angiography is performed to identify the exact location and size of the fistula and its venous drainage. To address the high flow, consider angiography at 7.5 fps, instead of the usual 2–4 fps. In addition to the CCF, also look for other vascular injuries/anomalies.

Selective catheterization of both ECAs and ICAs are performed, to assess their contribution to the CCF.

Angiography is also performed after manual compression of the CCA on the side of fistula, to better assess cross flow from the contralateral side. The digital compression will attenuate the high blood flow to the fistula, enabling its visualization. Do not compress both carotids simultaneously.

Rotational angiography with 3D reformatting, may be performed to study the fistula and select appropriate working views for intervention. It is important to be cognizant of the venous involve- ment including, cavernous sinuses, superior and inferior ophthalmic veins, sphenoparietal sinus, superior and inferior petrosal sinuses and the pterygoid plexi.

The following routes may be utilized for treating CCF: Transarterial; transvenous; and, via superi- or ophthalmic vein (if conventional routes are not available). Other indications: corneal exposure, diplopia, proptosis, intolerable bruits or headaches [1].

Coils

Carotid cavernous fistula coil embolization.

Onyx

Onyx for carotid cavernous fistula embolization.

NBCA

NBCA should be used with great caution, preferably after having slowed the flow through the CCF in order to prevent untoward deposition in the venous sinuses. There is also potential for reflux into the carotid artery, which could cause a stroke. This may particularly occur when the CCF closure is near completion and the pressure gradient between the carotid artery and the CS is lowered. As with Onyx, a balloon can be inflated in the parent artery to protect it.

Detachable balloons

Detachable balloons were initially utilized with success for endovascular CCF treatment and remain available outside of the US; however, these balloons are no longer available in the U.S. due to technical concerns relating to premature detachment and deflation over time.

Coil occlusion of the ICA

The desirable treatment for CCF is the occlusion of the fistula itself, essentially resulting in ICA reconstruction. This is frequently not possible. If the CCF is not amenable to treatment by any other route, sacrifice of the involved ICA is an option, especially if satisfactory supply has been confirmed from the contralateral ICA via anterior communicating and/or supply via the posterior communicating arteries.

Post-operative management and follow up

Post-op orders

● Admit the patient to NSICU for overnight observation. Further ICU stay will depend upon the patient’s clinical condition.

● Consult or arrange follow up with ophthalmic surgery.

● 0.9% NS+ 20 meq KCl@ 150cc/hr X 2hrs, then decrease to 100cc/hr if patient is NPO overnight, then advance diet as tolerated.

● Keep the leg that was used for procedure straight for 2 hrs in case of Angioseal closure, or 6–8 hours when manual compression was applied. May elevate 15o HOBe.g., a pillow under the head.

● Checkgroin,DPs, vitals and neurochecks q 15min X 4,q 30min X 4,then q hr

● Review/Resume preprocedure medications (Hold metformin for 48 hours after intervention; hold all oral hypoglycemics, until good PO intake established).

Follow-up

● D/Cnext morning after mobilizing, if there are no complications /other ongoing medical concerns requiring hospitalization.

● F/u on outpatient basis in 4 weeks.

● F/u angiography at 3 months.

Complications

Acquired proptosis and progressive abducens nerve palsy due to overpacked coiling material: rare sequelae of carotid cavernous fistula embolization [2].

1)
Chalouhi N, Dumont AS, Tjoumakaris S, Gonzalez LF, Bilyk JR, Randazzo C, Hasan D, Dalyai RT, Rosenwasser R, Jabbour P. The superior ophthalmic vein approach for the treatment of carotid-cavernous fistulas: a novel technique using Onyx. Neurosurg Focus. 2012; 32. DOI: 10.3171/2012.1.FOCUS123
2)
Teoh RJJ, Ain Masnon N, Bahari NA, Ch'ng LS. Acquired proptosis and progressive abducens nerve palsy due to overpacked coiling material: rare sequelae of endovascular treatment for carotid cavernous fistula. BMJ Case Rep. 2023 Oct 10;16(10):e255406. doi: 10.1136/bcr-2023-255406. PMID: 37816571.