

# Cavernous Internal Carotid Artery Aneurysm Treatment

- [Outcome of Detachable Balloon Embolization in Traumatic Carotid Cavernous Fistula](#)
- [Endovascular Treatment of Direct Carotid-Cavernous Fistula in a Patient with Loays-Dietz Syndrome](#)
- [A 7-year retrospective single-center study on treatment strategy and clinical outcome of giant intracranial aneurysm](#)
- [A Case of thrombosed intracavernous carotid giant aneurysm with ipsilateral carotid thrombosis: Imaging, and management challenges](#)
- [A 15-year follow-up of permanent intraoperative internal carotid artery occlusion for hemostasis in a giant cavernous sinus hemangioma: a case report](#)
- [Adjunctive Coiling in Flow Diverter Treatment Does Not Prevent Delayed Rupture: A Nationwide Survey](#)
- [Spontaneous carotid-cavernous sinus fistula with fibromuscular dysplasia: illustrative case](#)
- [Unexpected internal carotid artery injury during endoscopic transsphenoidal surgery](#)

Several options are currently available regarding the management of CCAs with resultant good outcomes, namely expectant management, luminal preservation strategies with or without addressing the aneurysm directly, and [Hunterian ligation](#) with or without revascularization procedures<sup>1)</sup>.

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Treatment of a cavernous internal carotid artery (ICA) aneurysm depends on various factors, including the aneurysm's size, shape, symptoms, and risk of rupture or growth.

## Observation and Medical Management

Indication: Small aneurysms with no symptoms or minimal risk of rupture. Actions: Regular monitoring with imaging (e.g., CT angiography or MR angiography). Blood pressure management and smoking cessation. Control of risk factors like hyperlipidemia or diabetes.

## Endovascular Treatment

Preferred for most cases due to its minimally invasive nature. Techniques: Flow Diversion: Placement of flow-diverting stents like the Pipeline Embolization Device. These devices redirect blood flow away from the aneurysm, promoting thrombosis within the sac and reducing rupture risk. Coiling: Placement of detachable coils to occlude the aneurysm. Parent Vessel Occlusion: Involves closing off the ICA proximal to the aneurysm (requires adequate collateral circulation to ensure brain perfusion, usually confirmed via balloon occlusion test).

## Surgical Management

Rarely performed due to the complexity and risks associated with the cavernous segment of the ICA. Options: Direct Clipping: Generally avoided due to the deep location and proximity to critical neurovascular structures. Bypass Surgery: High-flow or low-flow bypass to maintain perfusion if ICA sacrifice is necessary.

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Direct aneurysm clipping is technically difficult and results in a significant postoperative neurological deficit. Therefore, several techniques of indirect surgical treatment were developed with different surgical outcomes, such as proximal [internal carotid artery occlusion](#) (ICA) or [trapping](#) with or without [bypass](#) ([Superficial temporal artery to middle cerebral artery bypass](#) or high-flow bypass). High-flow bypass with proximal ICA occlusion seems to be the most appropriate surgical treatment for CCA because of the high rate of symptom improvement, aneurysm [thrombosis](#), and minimal postoperative [complications](#). However, in cases of CCA presented with direct [carotid cavernous fistula](#), the appropriate surgical treatment is high-flow bypass with aneurysm trapping, which the fistula can be obliterated immediately after surgery <sup>2)</sup>.

## Symptom-Specific Interventions

For Mass Effect Symptoms: If the aneurysm compresses cranial nerves causing pain or dysfunction: Endovascular techniques are typically first-line. Decompression may alleviate symptoms. For Ruptured Aneurysms: Rupture in this location is rare due to the low-pressure venous system, but prompt treatment with endovascular methods is indicated.

## Experimental or Adjunctive Therapies

Ongoing research into newer devices (e.g., advanced flow diverters, intrasaccular devices) and pharmacological agents to optimize outcomes. Factors Influencing Treatment Choice Size and Growth: Larger or growing aneurysms are more likely to be treated. Symptoms: Presence of cranial nerve palsies or other mass effects increases the need for intervention. Patient Factors: Age, comorbidities, and life expectancy. Anatomy: Adequacy of collateral circulation and feasibility of endovascular access. Complications of Treatment Endovascular: Vessel occlusion or ischemia. Stent migration or thrombosis (requires antiplatelet therapy). Surgical: Cranial nerve injury. Hemorrhage or infection. For cavernous ICA aneurysms, endovascular therapy, particularly flow diversion, is the gold standard for most symptomatic or high-risk aneurysms.

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<sup>1)</sup>

Eddleman CS, Hurley MC, Bendok BR, Batjer HH. Cavernous carotid aneurysms: to treat or not to treat? *Neurosurg Focus*. 2009 May;26(5):E4. doi: 10.3171/2009.2.FOCUS0920. Review. PubMed PMID: 19409005.

<sup>2)</sup>

Sriamornrattanakul K, Sakarunchai I, Yamashiro K, Yamada Y, Suyama D, Kawase T, Kato Y. Surgical

treatment of large and giant cavernous carotid aneurysms. Asian J Neurosurg. 2017 Jul-Sep;12(3):382-388. doi: 10.4103/1793-5482.180930. Review. PubMed PMID: 28761512; PubMed Central PMCID: PMC5532919.

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