# Superficial temporal artery to superior cerebellar artery bypass (STA-SCA bypass)

### Indications

The results of superficial temporal artery to superior cerebellar artery anastomosis are better than those for intracranial vertebral endarterectomy for patients with symptomatic intracranial vertebral artery stenosis. The use of intracranial vertebral endarterectomy should be limited to patients who have disabling symptoms despite medical therapy, a focal lesion proximal to the PICA, and a patent posterior circulation collateral or bypass<sup>1)</sup>.

In selected cases of patients in good neurological condition with ruptured fusiform aneurysms at the proximal segments of SCA and who have poor evidence of collateral supply, the possibility of a STA-SCA bypass with aneurysm trapping must be considered <sup>2</sup>.

Although only a few cases of fusiform aneurysms in the supracerebellar artery (SCA) have been reported in the literature, the treatment strategies adopted were diverse.

In summary, a very cautious and conservative approach should be taken prior to considering intracranial bypass to the superior cerebellar or posterior cerebral artery <sup>3)</sup>.

## **Surgical Technique**

The subtemporal approach for a superficial temporal artery-to-superior cerebellar artery bypass requires significant superior retraction that can injure the temporal lobe, compromise veins, and cause edema postoperatively. In contrast, the pretemporal approach requires posterolateral retraction that seems to be less injurious to the temporal lobe and better tolerated clinically.

Pretemporal exposure of the PCA is equivalent to subtemporal exposure of the SCA, but the pretemporal approach is facilitated by a larger recipient artery. Posterolateral temporal lobe retraction associated with the pretemporal approach is gentler than superior retraction with the subtemporal approach <sup>4</sup>.

### **Case reports**

Ausman et al., published in 1990 50 patients with superficial temporal artery (STA) to superior cerebellar artery (SCA) anastomosis <sup>5)</sup>.

Ogawa et al., published 30 cases undergoing superficial temporal artery-superior cerebellar artery (STA-SCA) bypass surgery. Postoperative angiogram showed the patency of the anastomoses in all cases. No serious surgical complications were observed. The outcome on discharge was excellent, with no morbidity and one mortality which was due to cardiac infarction. In the follow-up study, there were four cases with ischemic symptoms, two with transient ischemic attack and two with completed stroke, one of which was a supratentorial infarction due to internal carotid artery occlusion and the

other was a small infarction of pons. There were also two deaths due to cardiac infarction and diabetes mellitus. Favorable outcomes were obtained for the remaining cases. The present study suggests that, STA-SCA bypass, can be performed without surgical and systemic complications and used as an effective therapy for vertebrobasilar ischemia<sup>6)</sup>.

The authors used positron emission tomography to investigate the cerebral blood flow (CBF) and metabolism of eight patients undergoing superficial temporal artery (STA)-superior cerebellar artery (SCA) bypass procedures. In the preoperative studies, CBF in the region of the posterior fossa was low and the oxygen extraction fraction (OEF) was high, the so-called "misery perfusion syndrome." Such changes were evident in both the posterior circulation and the anterior circulation regions. Postoperatively, there was a significant increase in CBF, a significant decrease in the OEF not only in the region of posterior circulation but also over the entire brain, and a disappearance of the uncoupling between CBF and oxygen metabolism. The STA-SCA bypass procedure is effective in improving CBF and metabolism in patients with vertebrobasilar occlusive disease<sup>7)</sup>.

Inoue et al., published 7 cases <sup>8)</sup>.

Lawton et al., published 4 cases <sup>9)</sup>.

A 65-year-old man who 20 years earlier had presented with symptoms suggestive of brainstem compression. Imaging at the time revealed a giant, serpentine aneurysm of the basilar artery. The patient was treated with superficial temporal artery to superior cerebellar artery bypass and decompression of the aneurysm contents. Twenty years after this treatment, the patient remains functionally intact with few sequelae from his treatment or the pathology. Follow-up imaging reveals thrombosis of the aneurysm without ischemic damage to the brainstem.

This case demonstrates that good functional outcomes are possible for select complex posterior circulation aneurysms by using flow reversal and revascularization; however, at this time, we are unable to predict for which patients this strategy will be successful <sup>10</sup>.

A 68-year-old man was diagnosed with infarction of the cerebellum and medulla oblongata caused by vertebral artery dissection manifesting as severe stenosis with poor collateral flow. He underwent superficial temporal artery (STA)-superior cerebellar artery (SCA) bypass for the prevention of fatal brain stem infarction. He had consciousness disturbance 2 days postoperatively. Single-photon emission computed tomography revealed hyperperfusion in the posterior circulation. His consciousness improved as hyperperfusion improved. They report the first case of posterior circulation hyperperfusion syndrome after STA-SCA bypass<sup>11</sup>.

A 67-year-old woman with a recent history of recurrent ischemic stroke secondary to right vertebral artery stenosis suffered acute onset of left homonymous hemianopsia and the medial longitudinal fasciculus syndrome, which resolved with hyperdynamic therapy. However, consciousness deteriorated 6 hours later. Perfusion computed tomography (CT) revealed regions of prolonged mean transit time in the bilateral cerebellar hemispheres, vermis, brainstem, and right occipital lobe, which were more extensive than the ischemic lesions demonstrated by diffusion-weighted magnetic

resonance (MR) imaging. Subsequent cerebral angiography showed occlusion of the right vertebral artery. The patient underwent emergent left superficial temporal artery to left superior cerebellar artery bypass. Postoperatively she demonstrated resolution of the preoperative perfusion CT/diffusion-weighted MR imaging mismatch and improved neurological deficits. Early revascularization in a patient with perfusion CT/diffusion-weighted MR imaging mismatch following acute vertebrobasilar stroke can lead to improvement in cerebral perfusion and neurological function <sup>12</sup>.

A 60-year-old man with vertebrobasilar ischemia unrelieved by anticoagulation was found to have a midbasilar artery stenosis with an inadequate basilar collateral circulation. He underwent a right superficial temporal-superior cerebellar artery bypass. Following this operation he had a subarachnoid hemorrhage and right third nerve palsy that was due to formation of a pseudoaneurysm at the site of the anastomosis. This aneurysm was managed by ligation of the right superficial temporal artery. Subsequently it became necessary to perform a left superficial temporal artery-superior cerebellar artery bypass because of severe posterior circulation ischemic symptoms<sup>13</sup>.

A 47-year-old male was admitted to our hospital on November 9, 1984, because of sudden onset of dysarthria and ataxic gait. CT revealed a low density area in the pons. Left vertebral angiogram showed occlusion of the left vertebral artery just distal to the origin of the posterior inferior cerebellar artery (PICA). Arterial branch of the left cerebellar hemisphere were filled via the left PICA to the left SCA and anterior inferior cerebellar artery anastomosis. Right brachial angiogram showed the hypoplastic right vertebral artery which ended at the PICA. The rostral basilar artery, both posterior cerebral arteries (PCA's) and right SCA were filled through anastomosis from the right PICA. The posterior circulation was not filled by either of the carotid arteries. In spite of antiplatelet agglutination therapy, the patient had two more episodes of dysarthria, dysphagia, right hemiparesis and gait disturbance. Because of progressing stroke, STA-SCA anastomosis was carried out on the right side on February 27, 1985. During operation, the blood pressure was maintained above the level of 130 mmHg, and intravenous mannitol injection and spinal drainage were done to preserve the right temporal lobe from intracerebral hematoma and/or edema caused by retraction. Postoperatively, the patient has been free from new ischemic attack. He has only slight hemiparesis now eight months after operation. Right external carotid angiogram showed a patent STA-SCA bypass and good filling of SCA's and PCA's bilaterally <sup>14)</sup>.

A 56-year-old comatose man with acute basilar artery occlusion was successfully treated with local urokinase infusion which reopened the basilar artery and revealed a midbasilar stenotic plaque. This procedure was followed by a superficial temporal artery to superior cerebellar artery anastomosis for protection of the posterior circulation <sup>15</sup>.

1)

Ausman JI, Diaz FG, Sadasivan B, Dujovny M. Intracranial vertebral endarterectomy. Neurosurgery. 1990 Mar;26(3):465-71. PubMed PMID: 2320215.

Lamis FC, De Paiva Neto MA, Cavalheiro S. Fusiform superior cerebellar artery aneurysm treated with STA-SCA bypass and trapping. Surg Neurol Int. 2014 Jun 19;5(Suppl 4):S139-42. doi: 10.4103/2152-7806.134806. eCollection 2014. PubMed PMID: 25071936; PubMed Central PMCID:

### PMC4109170.

Hopkins LN, Budny JL. Complications of intracranial bypass for vertebrobasilar insufficiency. J Neurosurg. 1989 Feb;70(2):207-11. Review. PubMed PMID: 2643687.

Zador Z, Lu DC, Arnold CM, Lawton MT. Deep bypasses to the distal posterior circulation: anatomical and clinical comparison of pretemporal and subtemporal approaches. Neurosurgery. 2010 Jan;66(1):92-100; discussion 100-1. doi: 10.1227/01.NEU.0000362034.81037.FC. PubMed PMID: 19935435.

Ausman JI, Diaz FG, Vacca DF, Sadasivan B. Superficial temporal and occipital artery bypass pedicles to superior, anterior inferior, and posterior inferior cerebellar arteries for vertebrobasilar insufficiency. J Neurosurg. 1990 Apr;72(4):554-8. PubMed PMID: 2319313.

Ogawa A, Yoshimoto T, Sakurai Y. Clinical analysis of STA-SCA bypass for vertebrobasilar occlusive disease. Tohoku J Exp Med. 1991 Jul;164(3):183-90. PubMed PMID: 1755011.

Ogawa A, Kameyama M, Muraishi K, Yoshimoto T, Ito M, Sakurai Y. Cerebral blood flow and metabolism following superficial temporal artery to superior cerebellar artery bypass for vertebrobasilar occlusive disease. J Neurosurg. 1992 Jun;76(6):955-60. PubMed PMID: 1588429.

Inoue T, Tamura A, Tsutsumi K, Saito I, Saito N. Acute to subacute surgical revascularization for progressing stroke in atherosclerotic vertebrobasilar occlusion. Acta Neurochir (Wien). 2012 Aug;154(8):1455-61; discussion 1461. doi: 10.1007/s00701-012-1398-x. Epub 2012 Jun 9. PubMed PMID: 22684374.

Lawton MT, Hamilton MG, Morcos JJ, Spetzler RF. Revascularization and aneurysm surgery: current techniques, indications, and outcome. Neurosurgery. 1996 Jan;38(1):83-92; discussion 92-4. PubMed PMID: 8747955.

Kalani MY, Zabramski JM, Nakaji P, Spetzler RF. Twenty-Year Follow-up of Flow Reversal and Revascularization for a Giant Serpentine Basilar Artery Aneurysm. Neurosurgery. 2014 Sep;10 Suppl 3:E493-7. doi: 10.1227/NEU.00000000000438. PubMed PMID: 24871144.

Fukuda K, Abe H, Ueba T, Okawa M, Higashi T, Inoue T. Posterior circulation hyperperfusion syndrome after superficial temporal artery-superior cerebellar artery bypass for vertebral artery dissection. J Stroke Cerebrovasc Dis. 2014 Mar;23(3):583-6. doi: 10.1016/j.jstrokecerebrovasdis.2013.04.037. Epub 2013 May 28. PubMed PMID: 23721618.

Ogasawara K, Sasaki M, Tomitsuka N, Kubo Y, Inoue T, Ogawa A. Early revascularization in a patient with perfusion computed tomography/diffusion-weighted magnetic resonance imaging mismatch secondary to acute vertebral artery occlusion. Case report. Neurol Med Chir (Tokyo). 2005 Jun;45(6):306-10. PubMed PMID: 15973064.

Morgan M, Besser M, Tuck R. Pseudoaneurysm complicating superficial temporal artery-superior cerebellar artery bypass. Surg Neurol. 1986 Sep;26(3):277-81. PubMed PMID: 3738723.

Terai Y, Fujimoto S, Kawauchi M, Kinugasa K, Nishimoto A. [Superficial temporal to superior cerebellar artery anastomosis for rostral brain stem infarction]. No Shinkei Geka. 1986 Oct;14(11):1347-52. Japanese. PubMed PMID: 3808195.

#### 15)

Morgan JK, Sadasivan B, Ausman JI, Mehta B. Thrombolytic therapy and posterior circulation extracranial-intracranial bypass for acute basilar artery thrombosis. Case report. Surg Neurol. 1990

Jan;33(1):43-7. PubMed PMID: 2300877.

From:

https://neurosurgerywiki.com/wiki/ - Neurosurgery Wiki

Permanent link: https://neurosurgerywiki.com/wiki/doku.php?id=superficial\_temporal\_artery\_to\_superior\_cerebellar\_artery\_bypass

Last update: 2024/06/07 02:58

