Occipital artery to posterior inferior cerebellar artery anastomosis

The length, diameter, and flow accomodated by the occipital artery (OA) make it an ideal choice as a conduit for posterior circulation bypass. The bypass from the OA to the caudal loop of the PICA demonstrates the least difference in vessel diameter, and is therefore best suited for EC-IC bypass procedures in the posterior circulation [1)].

Awareness of the existence of an extradural origin of the PICA and a direct connection of this vessel with the occipital artery (OA) is of great relevance to the muscular stage of suboccipital approaches to the posterior craniovertebral junction [2)].

Although occipital artery (OA)-to-posterior inferior cerebellar artery (PICA) anastomosis is the most familiar reconstruction for posterior cerebral circulation, the procedure is considered difficult because of the anatomical complex course of OA and the depth of the operative field at the anastomosis site.

Katsuno et al. attempted a safe and reliable method for OA-to-PICA anastomosis under multiple-layer dissection of suboccipital muscles and a reverse C-shaped skin incision. We reviewed the clinical records of patients who underwent OA-to-PICA anastomosis in our institute, and report the outcome with special emphasis on graft patency and surgical complications. Nine patients are described. In one patient the bypass was accomplished at the cortical segment of the PICA and in all others at the caudal loop. The average time for de-clamping the PICA was 29 min and 29 s. Although the overall graft patency rate was 100%, one patient showed a new medulla infarction at the time of post-operatory three-dimensional computed tomography angiography. Besides a secure OA-to-PICA anastomosis, this technique allows safe harvest of the OA and the creation of a shallow and wide anastomosis field [3)].

Indications

Patients with symptomatic severe bilateral vertebral or basilar artery disease have a grave prognosis and the option of a surgical arterial pedicle revascularization procedure should be offered to them [4)]

Case reports

A 50-year-old woman presented with left PICA territory infarction. Left vertebral angiography (VAG) showed occlusion of the left VA at the proximal V4 segment. Right VAG revealed that the distal part of the left V4 segment with fusiform aneurysmal dilatation was reconstituted through vertebrobasilar junction, and the left PICA was the outlet of the blood flow from the fusiform aneurysm. Although the patient was treated conservatively, enlargement of the left VA fusiform aneurysm was observed 8 months after the initial presentation. Considering the potential risks for future stroke or bleeding, we performed clip occlusion of the origin of the left PICA, which could achieve outflow occlusion of the fusiform aneurysm with preservation of the perforators arising around the aneurysm. We created OA-PICA anastomosis for revascularization of the distal PICA. The postoperative course was uneventful, and the postoperative right VAG revealed occlusion of the fusiform aneurysm. Outflow occlusion instead of trapping is an effective surgical option for VA fusiform aneurysm to achieve obliterate the aneurysm with preservation of the perforator at the blind end [5)].

2014

Nossek et al. describe the technical nuances of an OA-PICA end-to-side bypass in a 63-year-old man with a dissecting ruptured aneurysm of the third segment (tonsilomedullary) of the PICA.

OA-PICA bypass option should remain as a treatment modality in the armamentarium of neurovascular surgeons [6].

1988

A unique example of posterior fossa revascularization is presented. A tandem bypass was performed by anastomosing the midoccipital artery to the posterior inferior cerebellar artery in a side-to-side fashion followed by anastomosis of the distal occipital artery to the anterior inferior cerebellar artery in an end-to-side fashion. The operation was designed to revascularize two separate vascular territories that were isolated in a patient thought to have an extremely compromised posterior circulation. The patient is doing well and is asymptomatic 3 years postoperatively [7].

1983

Occipital to posterior inferior cerebellar artery anastomosis [8].

1976

In a 58-year-old man who suffered a stroke and had multiple and extensive extracranial arterial occlusions, an anastomosis was completed between the right occipital artery and the right posterior inferior cerebellar artery. Cerebral angiograms performed two weeks post-operatively showed patent anastomosis and partial improvement of the posterior circulation [9].

1)
Ateş O, Ahmed AS, Niemann D, Başkaya MK. The occipital artery for posterior circulation bypass: microsurgical anatomy. Neurosurg Focus. 2008;24(2):E9. doi: 10.3171/FOC/2008/24/2/E9. PubMed PMID: 18275305.
2)
Tayebi Meybodi A, Lawton MT, Benet A. Dual Origin of Extradural Posterior Inferior Cerebellar Artery From Vertebral and Occipital Arteries: Anatomic Case Report. Neurosurgery. 2015 Jul 31. [Epub ahead of print] PubMed PMID: 26237343.
3)
Katsuno M, Tanikawa R, Uemori G, Kawasaki K, Izumi N, Hashimoto M. Occipital artery-to-posterior inferior cerebellar artery anastomosis with multiple-layer dissection of suboccipital muscles under a reverse C-shaped skin incision. Br J Neurosurg. 2015 Jun;29(3):401-5. doi: 10.3109/02688697.2015.1004300. Epub 2015 Jan 30. PubMed PMID: 25633907.
4)
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.
5)

Kochi R, Endo H, Fujimura M, Sato K, Sugiyama SI, Osawa SI, Tominaga T. Outflow Occlusion with Occipital Artery-Posterior Inferior Cerebellar Artery Bypass for Growing Vertebral Artery Fusiform Aneurysm with Ischemic Onset: A Case Report. J Stroke Cerebrovasc Dis. 2015 May 12. pii: S1052-3057(15)00213-X. doi: 10.1016/j.jstrokecerebrovasdis.2015.04.020. [Epub ahead of print] PubMed PMID: 25979424.

6) Nossek E, Chalif DJ, Dehdashti AR. How I do it: occipital artery to posterior inferior cerebellar artery bypass. Acta Neurochir (Wien). 2014 May;156(5):971-5. doi: 10.1007/s00701-014-2041-9. Epub 2014 Mar 8. PubMed PMID: 24610451.

7) Ausman JI, Pearce JE, Vacca DF, Diaz FG, Shrontz CE, Patel S. Tandem bypass: occipital artery to posterior inferior cerebellar artery side-to-side anastomosis and occipital artery to anterior inferior cerebellar artery end-to-side anastomosis–a case report. Neurosurgery. 1988 May;22(5):919-22. PubMed PMID: 3380284.

8) Kikuchi H, Karasawa J, Nagata I. [Occipital to posterior inferior cerebellar artery anastomosis]. No Shinkei Geka. 1983 Oct;11(10):1023-5. Japanese. PubMed PMID: 6646334.

9) Khodadad G. Occipital artery-posterior inferior cerebellar artery anastomosis. Surg Neurol. 1976 Apr;5(4):225-7. PubMed PMID: 1265632.