Neurochirurgie 65 (2019) 427–429

Disponible en ligne sur ScienceDirect www.sciencedirect.com

Elsevier Masson France EM|consulte www.em-consulte.com

Letter to the editor

Vertebral artery dissection associated with PICA aneurysm: PICA-PICA bypass technique

1. Introduction

Posterior inferior cerebellar artery (PICA) aneurysms are rare [1] and often complex to manage. A particular subgroup of PICA aneurysm consists of vertebral artery (VA) dissection associated with PICA aneurysm [2]. Some teams recommend a multimodal approach associating side-to-side PICA anastomosis to endovascular segmental occlusion of the VA (Vertebral artery) and PICA [3–5]. Here, we report the case of a 57-year-old woman with severe subarachnoid hemorrhage (SAH) related to rupture of a right VA dissecting aneurysm involving the PICA (Fig. 1A). Based on the aneurysm morphology and the involvement of the PICA, we decided to perform side-to-side anastomosis of the PICA (Fig. 1B), followed by endovascular occlusion of the V4 segment and the right PICA using coils (Fig. 1C). Postoperative angiography revealed complete occlusion of the aneurysm (Fig. 1D), and good patency of the bypass. At 1-year follow-up, the patient showed good neurological recovery, with the aneurysm fully excluded.

PICA-PICA bypass followed by endovascular sacrifice of the VA-PICA segment is thus a good therapeutic option for VA-PICA dissecting aneurysm [6].

2. Surgical technique

The patient was placed in standard prone position. The midline suboccipital and upper cervical regions were scrubbed and draped. A midline incision was made, caudal to the nuchal line down to the C4 spinous process. The suboccipital bone and C1 lamina were exposed subperiosteally. Suboccipital craniotomy with C1 laminectomy was performed. The dura was opened in a Y-shaped fashion.

Under microscopic vision, the arachnoid of the cisterna magna was incised. The two tonsils limited visualization of the 2 PICAs, and limited subpial tonsillectomy was therefore performed (video: 0:08–0:24). Some brainstem perforators at the tonsillomedullary and telovelotonsillar segments may be seen, and should be preserved throughout the operation. Unfortunately, we had to cut one telovelotonsillar artery (0:24–0:40) in order to perform the bypass. The p3 and p4 were well visualized (1:00–1:07). The medulla oblongata was protected by inserting a small piece of operative drape between the arteries and the bulb (1:08–1:11). The two inner sides of the PICA were marked with a surgical pen (1:12–1:20).

Anastomosis began with systemic heparin treatment. The physiological serum used to flush the surgical field and vessel lumen also contained heparin. Four temporary clips were applied, for proximal and distal vessel control (1:20–1:30).

Linear arteriotomy was performed on each inner side of the PICA (1:30–1:50). It is crucial that the lengths should be the same and at least double the diameter of the larger PICA. 9-0 nylon was used. The first knot is extremely important (1:58–2:39). The first suture must be on the back wall and very tight. The stitch ran outside-in in one artery and inside-out in the other. Hemi-suture was completed on the posterior side (2:40–3:43), followed by anterior suture (4:20–5:40). The surgeon must always make sure that the vessel lumen is perfectly permeable, with no transfixing stitch (5:38–5:43). Posterior suture was then completed (5:43–6:15). One distal clip was then removed, with only minimal bleeding (6:15–6:23). Surgicel® was applied to control the anastomosis. The second distal and left proximal clip were removed (6:23–6:37). The anastomosis was tested with the right proximal clip in place, as this artery was to be sacrificed after anastomosis. Infracyanine green (ICG) angiography revealed good bypass patency (6:38–6:54). The last proximal clip was removed (Fig. 1B). The craniectomy was not closed to prevent any mass effect of massive ischemic stroke in case of late bypass thrombosis. Final closure was similar to standard closure of a midline suboccipital craniotomy.

The patient was transferred to the neuroradiology suite, and the right V4 with first P1 segment was occluded by simple coiling (Fig. 1C). Arteriography revealed good occlusion of the dissected arterial segment, with good patency of the side-to-side PICA-PICA bypass (Fig. 1D).

3. Discussion

PICA aneurysm associated with VA dissection represents 14% of VA dissections [2]. As shown in the current case, PICA-PICA bypass followed by endovascular sacrifice of the VA-PICA segment seems to be a satisfactory treatment [6].

PICA-PICA bypass has several advantages. The proximity and parallel course of bilateral caudal PICA loops greatly facilitate mobilization and anastomosis to each other. Moreover, the two PICA segments are usually similar in size, which also facilitates bypass. The side-to-side bypass is simple, elegant and more anatomic than extracranial-intracranial counterparts. Associated to endovascular sacrifice of the VA-PICA junction, which avoids lower cranial nerve injury, it may be an elegant and efficient way to treat VDA involving the PICA [5,7,8]. Moreover, compared to endovascular treatment, it provides complete definitive exclusion of the aneurysm.

PICA-PICA bypass surgery has other indications. It could be considered for most dissecting or fusiform aneurysms of the first three PICA segments. On the other hand, it is not indicated in case of absence of PICA, hypoplastic PICA, >5 mm distance between the two caudal loops, or distal (P4 segment) PICA aneurysm because of the small caliber of the vessel and limited stroke size in case of artery sacrifice. Furthermore, special attention to the proximal part of the PICA is important because of the risk of ischemia of the short perforators running to the brainstem [9].

https://doi.org/10.1016/j.neuchi.2019.05.004

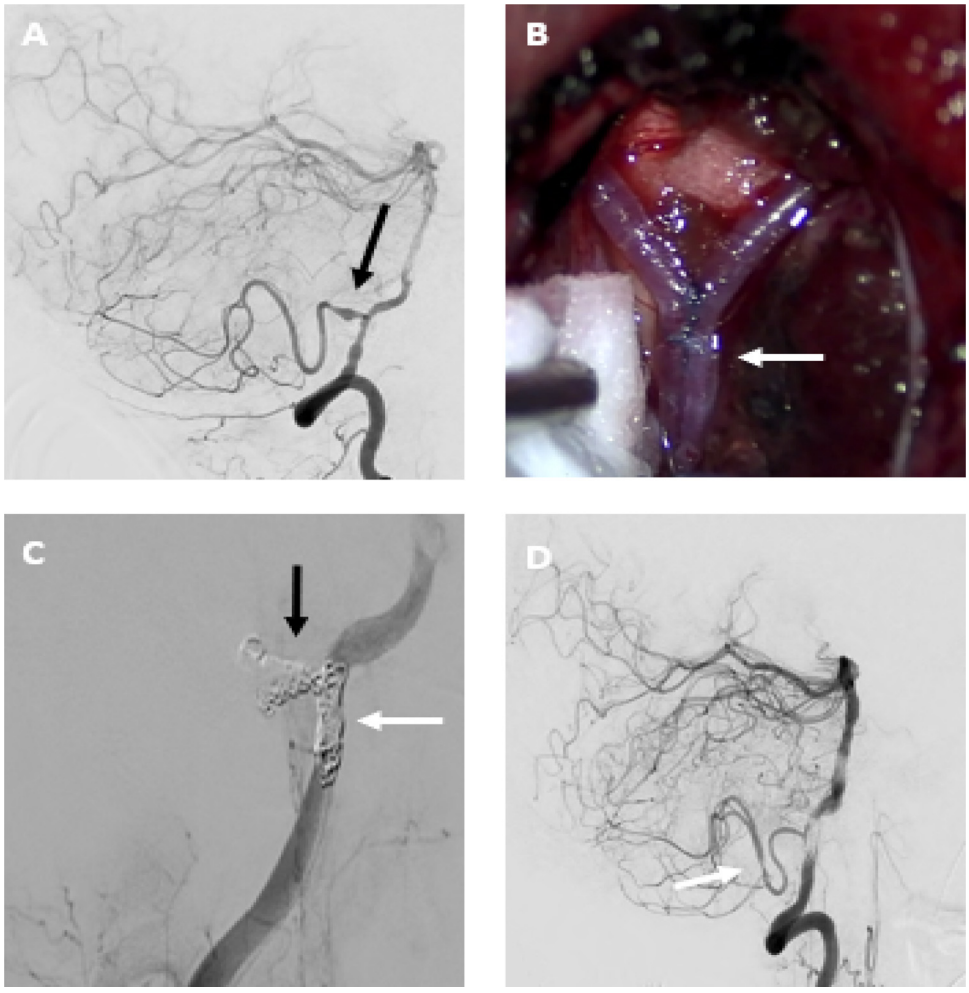

Fig. 1. A: DSA (digital subtraction angiography) (lateral view) revealing dissection of the right VA (vertebral artery), associated with dissecting aneurysm of the right PICA (arrow); B: Intra-operative view of PICA-PICA side-to-side anastomosis (white arrow); C: DSA (lateral view) showing occlusion of the right PICA (black arrow) and the final portion of the VA (white arrow); D: DSA (lateral view) showing good patency of the PICA-PICA bypass (white arrow).

4. Conclusion

VA-PICA dissecting aneurysm is a rare and challenging form of intracranial aneurysm. Standard aneurysm treatments such as endovascular coiling or surgical clipping provide poor results in this subset of aneurysm. A multimodal approach combining surgical in situ PICA-PICA bypass followed by endovascular sacrifice of the VA-PICA junction may be a good therapeutic option.

Disclosure of interest

The authors declare that they have no competing interest.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.neuchi.2019.05.004.

References

[1] Brisman JL, Song JK, Newell DW. Cerebral aneurysms. Engl N J Med 2006;355(9):928–39.
[2] Hernández-Durán S, Ogilvy CS. Clinical outcomes of patients with vertebral artery dissection treated endovascularly: a meta-analysis. Neurosurgical review 2014;37(4):569–77.
[3] Shi, Lei, et al. Therapeutic Progress in Treating Vertebral Dissecting Aneurysms Involving the Posterior Inferior Cerebellar Artery. Int J Med Sci 2016;13(7):540.
[4] Takikawa S, Kamiyama H, Nomura M, Abe H, Saitoh H. Vertebral dissecting aneurysm treated with trapping and bilateral posterior inferior cerebellar artery side-to side anastomosis; case report. No Shinkei Geka. Neurological Surgery 1991;19(6):571–6.
[5] Lemole Jr GM, Henn J, Javedan S, Deshmukh V, Spetzler RF. Cerebral revascularization performed using posterior inferior cerebellar artery-posterior inferior cerebellar artery bypass. Report of four cases and literature review. J Neurosurg 2002;97(1):219–23.
[6] Abla AA, McDougall CM, Breshears JD, Lawton MT. Intracranial-to-intracranial bypass for posterior inferior cerebellar artery aneurysms: options, technical challenges, and results in 35 patients. J Neurosurg 2016;124(5):1275–86.
[7] Chung SY, Yoon BH, Park MS, Kim SM. A case of endovascular treatment for followed by side to side bypass for vertebral artery dissecting aneurysms involved posterior inferior cerebellar artery. J Korean Neurosurg Soc 2014;55(1):36.
[8] Starke, Robert M, et al. Combined microsurgical PICA-PICA bypass and endovascular parent artery occlusion for a ruptured dissecting vertebral artery aneurysm. Neurosurgical Focus 2015:38 [videosuppl1:Video3].
[9] Lister JR, Rhoton Jr AL, Matsushima T, Peace DA. Microsurgical anatomy of the posterior inferior cerebellar artery. Neurosurgery 1982;10(2):170–99.

T. Metayer[a,c,*]
E. Emery[a,c]
M. Ismail[b]
T. Gaberel[a,c]
[a] *Department of Neurosurgery, Caen University Hospital, avenue de la Côte-de-Nacre, 14033 Caen, France*
[b] *Department of Radiology, University Hospital of Caen Normandy, 14000 Caen, France*
[c] *UNICAEN, Inserm, UMR-S U1237, Physiopathology and Imaging of Neurological Disorders (PhIND), GIP Cyceron, Normandie université, 14000 Caen, France*

* Corresponding author at: Department of Neurosurgery, Caen University Hospital, avenue de la Côte-de-Nacre, 14033 Caen, France.
E-mail address: thomas.metayer@neurochirurgie.fr (T. Metayer)

Received 24 May 2019

Received in revised form 26 May 2019

Accepted 26 May 2019
Available online 15 June 2019