Bifrontal Basal Interhemispheric Approach Case Series

Kiyofuji et al. published a retrospective case series and intraoperative microsurgical videos review. Three subcallosal distal anterior cerebral artery aneurysms were identified via retrospective query of ther institutional neurosurgical database from December 2017 to May 2018. Two were female; median age was 74 years (range 70-83); all 3 underwent bifrontal craniotomy via bicoronal skin incision for aneurysm clipping. Aneurysms were located in left pericallosal artery-callosomarginal artery junction, bifurcation of azygos A2, and pericallosal artery related with azygos A2, and the anterior interhemispheric approach was used in all 3 operations. No acute stroke, hemorrhage, or major complications occurred, and all patients remained neurologically intact at the time of last follow-up (median 3 months, range 1-6). Although DACA aneurysms are rare, they represent an important variant for cerebrovascular neurosurgeons where microsurgical clipping can have better angiographic outcomes than endovascular treatment. Detail-oriented anterior interhemispheric arachnoid dissection through bifrontal craniotomy with its lower margin sitting at the superior orbital rim maximizes safe and effective clipping of subcallosal DACA aneurysms [1)].

The unilateral interhemispheric approach is a well-known operative technique for distal anterior cerebral artery aneurysms (DACA). However, this approach presents several risks, such as postoperative venous infarction due to occasional sacrifice of the parasagittal bridging vein or postoperative frontal lobe damage due to retraction force. To overcome these risks, Cho et al., used a bifrontal craniotomy with a straight dural incision and cutting of the superior sagittal sinus (SSS). This method helps to overcome the shortcomings of the prior unilateral approach.

They retrospectively reviewed 61 aneurysm patients (42 unruptured- and 19 ruptured- A2 aneurysm and A3 aneurysm) who received clipping surgery through bifrontal interhemispheric approach between March 2007 and December 2017. This included 35 A2 aneurysms and 27 A3 aneurysms, and the mean size of the aneurysms was 5.45 mm. The modified bifrontal interhemispheric approach involved three steps: bifrontal craniotomy of the centrobasal portion of the frontal bone, ligation and division of the anterior one third of the superior sagittal sinus, and approaching the aneurysm via the interhemispheric space. All patients underwent computed tomography (CT) scans on the third and seventh postoperative days for the evaluation of brain retraction damage or venous infarction.

Of patients with ruptured aneurysms, 79% had a favorable outcome (Glasgow Outcome Scale 4 or 5) 6 months after primary subarachnoid hemorrhage and all patients with unruptured aneurysms had favorable outcomes. The surgical outcome was strongly related to the preoperative neurologic grade of Hunt and Hess (H-H). Three patients had poor outcomes due to their poor H-H grade on admission (Grade III: 2, IV: 1). In follow up CT scans, venous infarction did not occur in any of our 61 patients.

The modified bifrontal interhemispheric approach might be a safe and effective method for treating A2,3 aneurysm with relatively good clinical outcome and no surgery-related complications [2)].

In 48 patients with suprasellar lesions operated via bifrontal basal interhemispheric approach (BBIA) for midline suprasellar tumors over 7 years had postoperative seizures, meningitis, subdural effusion, and retraction site contusion in 12 (27%), 5 (11%), 4 (9%), and 1 (2.2%) patient, respectively. Three

patients died postoperatively and 19 (40%) patients required hormone replacement therapy. Amongst the patients with preoperative visual deficits, 23 (70%) had improvement in visual functions, in six (20%), there was no change and four (8.3%) patients had visual deterioration.

BBIA provides a true midline perspective and orientation, and permits complete and safe removal of midline suprasellar lesions in majority of cases. This approach is especially useful in retrochiasmatic tumors and in residual/recurrent tumors providing virgin plane of dissection [3].

Shibuya et al., describe the use of a bifrontal basal interhemispheric approach with or without division of the anterior communicating artery (ACoA) for removal of large craniopharyngiomas. This approach is a more basal modification of the anterior interhemispheric approach; allowing preservation of most bridging veins. Since 1988, 22 patients underwent operations using this approach to achieve total or near-total excision of large craniopharyngiomas. Division of the ACoA was performed in 11 of 17 patients with retrochiasmatic tumors with no early or late complications related to division of the artery. There were no operative mortalities. Visual improvement (59%) and preservation of the pituitary stalk (64%) were achieved in a high percentage of patients. Preservation of the pituitary stalk correlated well with postoperative pituitary function. The bifrontal basal interhemispheric approach allowed a bilateral, wider operative field with better orientation and views of important neural structures and perforating arteries without requiring combination with other approaches. When the ACoA limited operative exposure, the artery could be divided safely. The authors discuss indications for, and advantages of, the bifrontal basal interhemispheric approach with or without division of the ACoA in the removal of large craniopharyngiomas [4].

Suprasellar lesions present a surgical challenge due to their complex relationship with surrounding neurovascular structures. Of the approaches for these lesions, bifrontal basal interhemispheric approach (BBIA) gives a midline perspective of suprasellar anatomy and has certain advantages over lateral approaches.

Giant Olfactory groove meningioma surgery poses special problems and represents a surgical challenge [5].

Extension into the ethmoid sinuses or extensively involves the bony floor of the anterior fossa. The traditional bifrontal approach provides only limited exposure in these situations, and a bilateral fronto-orbitonasal approach may be more effective [6].

1)
Kiyofuji S, Sora S, Graffeo CS, Perry A, Link MJ. Anterior interhemispheric approach for clipping of subcallosal distal anterior cerebral artery aneurysms: case series and technical notes. Neurosurg Rev. 2019 Jun 11. doi: 10.1007/s10143-019-01126-z. [Epub ahead of print] PubMed PMID: 31187343.
2)
Cho YH, Yang IC, Kim YS, Kim TS, Joo SP. Bifrontal Interhemispheric Approach Involving Cutting the Superior Sagittal Sinus for Distal Anterior Cerebral Artery Aneurysms. World Neurosurg. 2019 Apr 10. pii: S1878-8750(19)31033-2. doi: 10.1016/j.wneu.2019.04.041. [Epub ahead of print] PubMed PMID: 30980976.
3)
Sinha S, Kumar A, Sharma BS. Bifrontal basal interhemispheric approach for midline suprasellar tumors: Our experience with forty-eight patients. Neurol India. 2013 November-

December;61(6):581-586. doi: 10.4103/0028-3886.125247. PubMed PMID: 24441323.
4)

Shibuya M, Takayasu M, Suzuki Y, Saito K, Sugita K. Bifrontal basal interhemispheric approach to craniopharyngioma resection with or without division of the anterior communicating artery. J Neurosurg. 1996 Jun;84(6):951-6. PubMed PMID: 8847589.
5)

Tomasello F, Angileri FF, Grasso G, Granata F, De Ponte FS, Alafaci C. Giant olfactory groove meningiomas: extent of frontal lobes damage and long-term outcome after the pterional approach. World Neurosurg. 2011 Sep-Oct;76(3-4):311-7; discussion 255-8. doi: 10.1016/j.wneu.2011.03.021. PubMed PMID: 21986430.
6)

Tamaki N, Yin D. Giant olfactory groove meningiomas: advantages of the bilateral fronto-orbitonasal approach. J Clin Neurosci. 1999 Jul;6(4):302-305. PubMed PMID: 10844751.