

Large Paraclinoid Aneurysms Treated By Combined Extradural and Intradural Approach

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Aneurysms arising from the internal carotid artery (ICA) having an intradural neck and partially intracavernous fundus have been reported as a distinct type of aneurysm. These aneurysms are referred to generally as "Paraclinoid"¹⁻⁴ and they have been considered to be challenging in the surgical management because of their anatomical location to the anterior clinoid process and the cavernous sinus.¹⁻⁹ They are seen to originate from the ventral surface of the ICA with the neck of aneurysm being distal to the ophthalmic artery and proximal to the posterior communication artery.^{1-5, 10} Large aneurysms are common in this location. The anatomical location of the large aneurysm has very important roles to its neighboring structures: the optic nerve, chiasm, pituitary stalk, hypothalamus, ICA, 3rd, 4rd, 6rd, and 1st division of the 5th cranial nerve, cavernous sinus, and osseous structures.^{1-9, 11-16}

This report presents our experience of a combined extradural and intradural surgical approach¹¹ to the aneurysm and a clinical summary of 3 patients, each having a large paraclinoid aneurysm treated with this surgical technique.

I. Summary of Cases

Between May, 1992, and June, 1992, 3 Patients, each having a large ventral paraclinoid carotid artery aneurysm were treated. This report describes opera-

tive technique and their results.

A standard ipsilateral fronto-temporal(pterional) craniotomy is made. The lateral sphenoid ridge to the posterior roof of the orbit is removed exposing the superior orbital fissure. The anterior clinoid process is subsequently drilled off extradurally. A part of the lateral wall of the optic canal is also removed with a diamond microdrill. During this stage of operative procedure, great care is exercised not to open the ethmoid sinus or damage it's dorsal cells and to avoid any injury to the orbital periosteum, the optic nerve, and structures in the superior orbital fissure. Paranasal sinus mucosa may in some cases extend into bone in this area. If mucosa is involved, the overlying bony opening must be carefully waxed. Removal of the anterior clinoid process permits easy access to the carotid cave.

Once the anterior clinoid process is removed and proximal portion of the optic nerve is unroofed, the dura is opened. Another relatively short separate dural incision is made longitudinally over the original site of the anterior clinoid process. This incision is extended to the carotid dural ring which is subsequently sectioned circumferentially to expose intracavernous segment of the ICA outside the major venous channels of the cavernous sinus.⁸ The inner layer of dura is opened in a direction parallel to the lateral edge of the optic nerve.⁴ After possible placement of temporary clipping of the ICA proximal to the ophthalmic

artery is ascertained, the aneurysm is further dissected and clipped(Fig 1). The dura and remaining wound are closed in layers according to routine procedure.



Fig 1. Intraoperative photograph of a large paraclinoid aneurysm(A), which is clipped. The flattened optic nerve(ON) is elevated and displaced medially.

In selected cases, ipsilateral cervical carotid arteries : the common, the internal, and the external carotid artery are exposed in a routine fashion for temporary occlusion or carotid ligation(Fig 2). This step of exposure of carotid arteries is recommended for any large or giant aneurysm.⁴

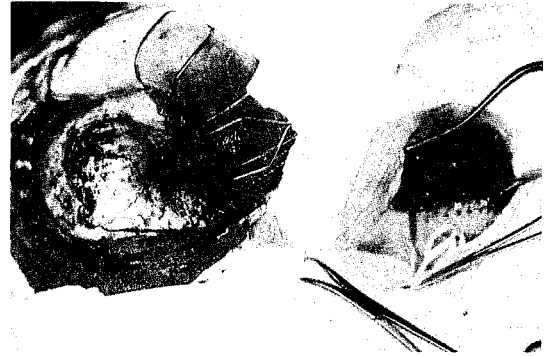


Fig 2. Photograph showing simultaneous craniotomy and exposure of the cervical carotid arteries.

The clinical summary of 3 patients treated for a paraclinoid carotid aneurysm is summarized in Table 1. There were 2 women and 1 man. Preponderance

Table 1. Clinical summary

Case No	Age(yrs) /Sex	Clinical presentation	Condition* on admission	Angiographic size(mm)	Actual size(mm)**	Surgery	Results
1	59/F	SAH	Grade II	12×7	15	Clipping	Very Well Visual decrease, OS : Improving Discharged on 10th P.O.day
2	27/M	Visual field defect (VFD)	Ipsilateral nasal VFD	16×10	25	Clipping and resection	Excellent VFD : improved Discharged on 9th P.O.day
3	43/F	Chronic headache	Poor vision, OD	18×14	28	Clipping and partial resection	Excellent. Vision : improving Discharged on 20th P.O.day

* Grading according to the Hunt and Kosnik system(Hunt WE, Kosnik EJ : Timing and preoperative care in intracranial aneurysm surgery. Clin neurosurg 21 : 79-89, 1974.)

**The largest diameter of aneurysmal neck or dome as measured at the time of the surgery.

of women with paraclinoid aneurysms were observed by others.^{2, 4, 5, 11, 13, 15} 1 of 3 patients had SAH. In general paraclinoid aneurysms do most frequently cause SAH. Between 50 and 70% of the patients have presented with SAH in literatures.^{1, 9, 12, 17}

The next most common symptoms and signs of these aneurysms are visual loss or visual field defect of ipsilateral eye usually from involvement of the optic nerve. In our experiences 2 of 3 patients had symptoms and signs of local mass lesions by compression of the optic nerve to cause ipsilateral nasal field defect in one patient and ipsilateral poor vision in the other one. Frequently, however, detailed ophthalmological evaluation reveals signs of chiasmal compression with bilateral temporal field defects in addition to unilateral decrease in visual acuity from compression of the ipsilateral optic nerve. Depending on the different series reported, between 20 and 50% of the patients present with symptoms of compression of the visual pathways.^{1, 3, 5, 9, 11}

The criteria selecting a patient for the study in this series was that the aneurysm must originate from the ventral surface of the ICA with the neck of aneurysm being distal to the ophthalmic and proximal to the posterior communicating artery.

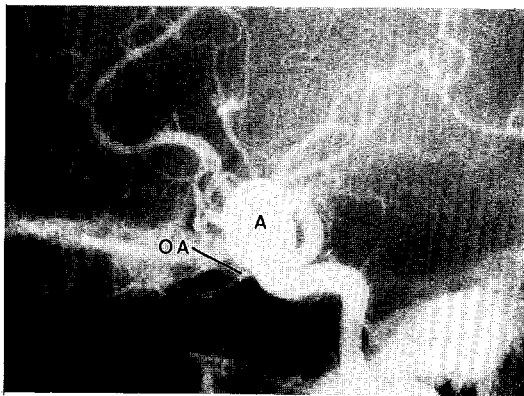


Fig 3. Preoperative lateral angiogram of a large paraclinoid aneurysm(A). The lesion projects superiorly and slightly medially, originating just beyond the ophthalmic artery(OA) take-off.

Preoperative evaluation included the angiographic study(Fig 3) and the visual status. All 3 patients had postoperative angiographic study within a week and the study revealed complete occlusion of the neck of aneurysms in all 3 patients(Fig 4). Postoperatively 2 of 3 patients made excellent recovery and one made good recovery with development of poor vision in the ipsilateral eye, but made progressive improvement.

Preoperatively shown visual field defect and poor vision made progressive improvement. Sizes of aneurysms ranged between 12 and 18mm in the largest diameter of each aneurysm on the preoperative angiographic study and actual size of aneurysms at the time of the operative procedure were between 15 and 28mm. Discrepancy between the actual and the angiographic size was most likely from arteriosclerotic changes and partial thrombosis of aneurysms.



Fig 4. Postoperative angiogram showing complete occlusion of the neck of the aneurysm while preserving the carotid artery and the ophthalmic artery (arrowhead).

II. Conclusion

3 large paraclinoid aneurysm patients were safely and successfully treated by a combined extradural and intradural approach.

From our experiences and from a review of the literature direct clipping can be done safely and successfully in the majority of the cases for large

paraclinoid carotid aneurysms. This form of treatment should be attempted whenever it seems feasible.

Great care must be exercised to avoid any injury to its neighboring osseous and neurovascular structures.

Large paraclinoid carotid aneurysms can be presented with non specific complaint of headache, SAH and or symptoms and signs of compression of the adjacent structures, most often of the optic nerve and chiasm to cause loss of vision or visual field defect.

References

1. Heros RC, Nelson PB, Ojemann RG, et al : Large and giant paraclinoid aneurysms : Surgical techniques, complications, and results. *Neurosurgery* 12 : 153-163, 1983.
2. Knosp E, Muller G, Perneczky A : The paraclinoid carotid artery : Anatomical aspects of a microneurosurgical approach. *Neurosurgery* 22 : 896-901, 1988.
3. Nutik SI : Ventral paraclinoid carotid aneurysms. *J Neurosurg* 69 : 340-344, 1988.
4. Ojemann RG, Heros RC, Crowell RM : Paraclinoid aneurysms in Surgical management of cerebrovascular disease. by Ojemann RG, Heros RC, Crowell RM, Williams and Wilkins, Baltimore, 1988, pp199-216.
5. Day AL : Aneurysms of the ophthalmic segment : A clinical and anatomical analysis. *J Neurosurg* 72 : 677-691, 1990/
6. Guidetti B, La Torre E : Management of carotid-ophthalmic aneurysms. *J Neurosurg* 42 : 438-442, 1975.
7. Harris FS, Rhoton AL Jr : Anatomy of the cavernous sinus. A microsurgical study. *J Neurosurg* 45 : 169-180, 1976.
8. Inoue T, Rhoton AL Jr, Theele D, et al : Surgical approaches to the cavernous sinus, A microsurgical study. *Neurosurgery* 26 : 903-932, 1990.
9. Yasargil MG, Gasser JC, Hodosh RM, et al : Carotid-ophthalmic aneurysms : direct surgical approach. *Surg Neurol* 8 : 155-165, 1977.
10. Benedetti A, Curri D : Direct attack on carotid-ophthalmic and large internal carotid aneurysms. *Surg Neurol* 8 : 49-54, 1977.
11. Dolenc VV : A combined epi- and subdural direct approach to carotid-ophthalmic artery aneurysms. *J Neurosurg* 62 : 667-672, 1985.
12. Guidetti B, Nicole S : Carotid-ophthalmic aneurysms. in Fein JM, Flamm ES(ed) : *Cerebrovascular Surgery*, Springer-Verlag, Berlin 1985, pp805-839.
13. Punt J : Some observations on aneurysms of the proximal internal carotid artery. *J Neurosurg* 51 : 151-154, 1979.
14. Raymond LA, Tew J : Large suprasellar aneurysms imitating pituitary tumour. *J Neurol Neurosurg Psychiatry* 41 : 83-87, 1978.
15. Sengupta RP, Gordon LG, Hakinson J : Carotid-ophthalmic aneurysms. *J Neurol Neurosurg Psychiatry* 39 : 837-853, 1976.
16. Yasargil MG : *Microneurosurgery*. Stuttgart, Thieme, 1984, Vol2.
17. Almedia GM, Shibata MK, Bianco E : Carotid-ophthalmic aneurysms. *Surg Neurol* 5 : 41-45, 1976.

=국문초록=

경막외 및 경막내 접근법을 이용한 상상돌기주위 대 동맥류의 외과적 치료

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1992년 5월부터 1992년 6월까지 상상돌기주위 경동맥에 생긴 큰 뇌동맥류 환자 3명을 치료하였다. 3명의 환자 모두에서 경막외 및 경막내 접근법으로 뇌동맥류를 성공적으로 결찰하였다. 2명은 여자였고, 1명은 남자였다. 3명중 1명에서는 입원당시 지주막하출혈이 있었고 2명에서는 국부종괴 병변에 의한 시신경 압박증상이 있었다. 수술후 환자들은 잘 회복되었고, 한명에서는 시력장애가 발생되었으나 점차 회복되었다. 수술전 시력장애는 수술후 호전되었다.

중심단어 : 동맥류, 상상돌기주위 경동맥, 경막외 및 경막내 접근법.

Key Words : Aneurysm, Paraclinoid carotid artery, Extradural and intradural approach