Posterior communicating artery aneurysm clipping

Pterional approach

See Pterional craniotomy.

For the more common aneurysm at the ICAp-comm junction, rotate head 15–30° from vertical

Less frontal lobe needs to be exposed than for an anterior communicating artery aneurysm.

Microsurgical dissection

Ultimately, the major vector of retraction will be on tip of temporal lobe (less on frontal lobe than in ACoA aneurysm), but the initial approach will be more anterior to reduce risk of intra-operative rupture.

1. dissect down sylvian fissure, retract frontal lobe and come down on optic nerve.

2. cautiously elevate temporal tip (aneurysm may be adherent to temporal tip and/or to tentorium), coagulate bridging temporal tip veins if necessary

3. incise arachnoid membrane along the optic nerve from anterior to posterior

4. open arachnoid and drain CSF to gain relaxation

5. start to dissect internal carotid artery at anterior margin (at junction with optic nerve) and work towards the posterior margin of carotid where the aneurysm is located (isolating the carotid gives proximal control). The aneurysm dome usually poin ts laterally, posteriorly and inferiorly, and is encountered before and usually blocks visualization of the p-comm. The aneurysm frequently projects behind the tentorial edge which then obscures the dome.

Critical branches to preserve: anterior choroidal artery, posterior communicating artery (pcomm). If necessary, the p-comm may be sacrificed (e.g. included in clip) without deleterious effect in most cases if there is not a fetal posterior communicating artery.

In spite of the advent of neurointerventional treatment, different clinical and anatomical features are still strong indications for clipping of posterior communicating artery (PComA) aneurysms. But the experience of young neurosurgeons is increasingly limited, and therefore providing technical operative guidelines is a fundamental prerequisite to achieve the best aneurysm exclusion and avoid perioperative complications.

Sturiale et al., described a technical algorithm we use to teach young neurosurgeons how to approach carotid aneurysms that may help them develop a procedural memory and thus perform an efficient

and safe surgery.

They reviewed there last 10 years of institutional experience of > 150 cases of clipping ruptured and unruptured PComA aneurysms, analyzing our technical refinements and the difficulties in teaching residents and young neurosurgeons how to establish fundamental key points and design a didactic algorithm that includes operative instructions and safety rules.

They recognized seven pragmatic technical key points regarding craniotomy, cisternostomy, proximal and distal control, aneurysm neck dissection, preservation of neurovascular structures, and clipping to use in a didactic algorithm for teaching residents and as operative instructions for inexperienced neurosurgeons.

In the setting of clipping PComA aneurysms, respect for surgical rules is of paramount importance to perform an efficacious and safe procedure and ensure the best aneurysm exclusion and preservation of neurovascular structures [1].

Because endovascular therapy alters the surgical population, neurosurgeons should recalibrate their expectations with this once straightforward aneurysm. The current mix of PCoA aneurysms requires advanced techniques including clinoidectomy, AChA microdissection, complex clipping, and facility with intraoperative rupture. Microsurgery is recommended for recurrent aneurysms after coiling, complex branches, aneurysms causing oculomotor nerve palsy, multiple aneurysms, and patients with hematomas [2].

Because fetal posterior communicating artery are the primary supply to the posterior cerebral artery (PCA), care must be taken not to compromise flow to this artery during clipping or coiling of posterior communicating artery aneurysms (PCOM). The incidence of the fetal PCOM variant is 4-29% of patients and bilateral fetal PCOM variants occur in 1-9% of patients.

Posterior communicating artery aneurysms with an elongated fundus, true posterior communicating artery aneurysms, and aneurysms associated with a fetal posterior communicating artery may have better outcome with surgical clipping in terms of completeness of occlusion and preservation of the posterior communicating artery. However, as endovascular technology improves, endovascular treatment of posterior communicating artery aneurysms may become equivalent or preferable in the near future [3].

Surgical clipping of PCoA aneurysms causing third nerve palsy achieves better ONP recovery than endovascular coiling. This result could be particularly true in the case of ruptured aneurysms. In view of the purely observational data, statements about this effect should be made with great caution. A randomized trial would address the therapeutic dilemma involved better, but pending the results of such a trial, Gaberel et al. recommend treating PCoA artery aneurysms causing ONP with surgery [4].

Posterior communicating artery aneurysms can be one of the easiest or one of the most difficult intracranial aneurysms to treat surgically.

The Posterior communicating artery is one of the first branches visualized during dissection of the carotid cistern and the dome of the aneurysm is typically directed away from approach trajectory. Wide dissection of the sylvian fissure is typically not necessary for successful clipping of these aneurysms. In fact, retraction of the temporal lobe is often avoided (particularly when the fundus points laterally) until the surgeon partially exposes the neck of the aneurysm. Anterior clinoidectomy

is rarely required for clipping of PCOM aneurysms. [5].

Anterior clinoidectomy, temporary clipping, adenosine-induced cardiac arrest, and intraoperative angiography are useful adjuncts during surgical clipping of these aneurysms.

References

1)
Sturiale CL, Marchese E, Puca A, Olivi A, Albanese A. Surgical Treatment of Posterior Communicating Artery Aneurysms: Hints and Precautions for Young Cerebrovascular Surgeons. J Neurol Surg A Cent Eur Neurosurg. 2019 Mar 26. doi: 10.1055/s-0039-1683397. [Epub ahead of print] PubMed PMID: 30913571.
2)
Sanai N, Caldwell N, Englot DJ, Lawton MT. Advanced technical skills are required for microsurgical clipping of posterior communicating artery aneurysms in the endovascular era. Neurosurgery. 2012 Aug;71(2):285-94; discussion 294-5. doi: 10.1227/NEU.0b013e318256c3eb. PubMed PMID: 22472555.
3) , 5)
Golshani K, Ferrell A, Zomorodi A, Smith TP, Britz GW. A review of the management of posterior communicating artery aneurysms in the modern era. Surg Neurol Int. 2010 Dec 22;1:88. doi: 10.4103/2152-7806.74147. PubMed PMID: 21206898; PubMed Central PMCID: PMC3011114.
4)
Gaberel T, Borha A, Palma CD, Emery E. Clipping versus coiling in the management of posterior communicating artery aneurysms with third nerve palsy: a systematic review and meta-analysis. World Neurosurg. 2015 Sep 23. pii: S1878-8750(15)01189-4. doi: 10.1016/j.wneu.2015.09.026. [Epub ahead of print] PubMed PMID: 26409080.