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Surgical Difficulties in a Case of Left Ophthalmic Artery Ruptured Aneurysm Associated with Right ICA hypoplasia - Case Report

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Rezumat

Dificultăți operatorii într-un caz de anevrism de arteră oftalmică stângă asociat cu hipoplazia arterei carotide interne dreaptă - prezentare de caz

Autorii prezintă cazul rar al unei paciente în varstă de 49 de ani la care s-a depistat un anevrism rupt de arteră oftalmică asociat hipoplaziei arterei carotide interne drepte. Particularitatea cazului rezidă în hipoplazia arterei carotide interne drepte, asociată unui anevrism de arteră oftalmică. Astfel de cazuri sunt foarte rar relatate în literatură. În cazul de față opțiunea microchirurgicală a reprezentat singura șansă la un rezultat favorabil al pacientei datorită lipsei echipei de embolizatori. Spre deosebire de multe centre neurochirurgicale din Europa de Vest, unde abordurile endovasculare au depășit microchirurgia, în România, microchirurgia deschisă este frecvent folosită întrucât permite neurochirurgului să controleze perfect mediul în care operează și minimizează șansele de complicații ale tehnicilor endovasculare care devin din ce în ce mai frecvente. Astfel, echipele de neurochirurgi se bucură de o autonomie sporită putând aborda o gamă variată de procese patologice, care în alte țări se bucură de atenția exclusivă a unor departamente înalt specializate.

Cuvinte cheie: anevrism intracranian, anevrism artera oftalmică, clipping, ICA, Angio-CT, hipoplazie arteră carotidă internă

Abstract

The authors present a rare case of a ruptured left ophthalmic artery aneurysm associated with right ICA hypoplasia in a 49 year old female. The particularity of the case lies in the fact that the patient had a hypoplastic right ICA which was associated with an intracranial aneurysm. In the case we present, surgery was mandatory as it represented the patient's only chance for a favorable outcome, given the lack of an adequate team specialized in endovascular coiling. Unlike many neurosurgical centers in Western Europe and the US where endovascular approaches have overtaken microsurgery, in Romania open microsurgery is frequently performed as it allows neurosurgeons to perfectly control the environment in which they operate and minimizes possible complications of coiling or stenting which become more and more frequent in other countries.

Key words: intracranial aneurysm, ophthalmic artery aneurysm, clipping, ICA, DSA, Angio-CT, hypoplastic ICA

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Background

Vascular neurosurgery is perhaps one of the most difficult

and unforgiving segments of neurosurgery. Besides being a master of the surgical anatomy of the brain and its blood vessels, a vascular neurosurgeon must be experienced enough to be able to anticipate and react quickly to blood loss but other unforseen consequences as well.

Surgery for intracranial aneurysms has come a long way from the time of Victor Horsley, (1857 – 1916), Harvey Cushing (1869-1939) and Walter Dandy (1886-1946) who can be considered the early pioneers of vascular neurosurgery (1). Although Horsley was the first to perform the ligature of an unruptured aneurysm in 1885, Cushing was the one to identify the necessity to secure unruptured aneurysms (2) and Dandy (3) was the one to perform the first modern clipping of such aneurysms in 1937. As time passed several key-contributions have undoubtedly changed this elite branch of neurosurgery. One of the first notable contributions to vascular neurosurgery came under the shape of Egas Moniz's angiography in 1927, the first embolization performed in 1941 By Werner (4) using silver wire, Seldinger's catheterization technique in 1953, Yasargil's dedicated aneurysm clips and use of surgical microscope in 1953 and 1968, Hounsfiend and Cormack's Computed Tomography (CT) in 1975 and last but not least the recently implemented Cone Beam Computed Tomography Angiography (CBCT-A) (5).

Intracranial aneurysms represent approximatively 0.2-7.9% of all cerebrovascular pathologic entities. Out of the total number of aneurysms an approximate 5% are aneurysms situated on the ophthalmic artery. The clinical particularity of ophthalmic artery aneurysms lies in the fact that ophthalmic artery aneurysms become symptomatic only when they reach large dimensions. From a technical point of view, ophthalmic artery aneurysms represent a very difficult challenge both for the neurosurgeon but also for the interventional neuroradiologist due to their proximity to the optic nerve and anterior clinoid process (6). The rather recent techniques of endovascular embolization for aneurysms have greatly improved the patient survival rates and the subsequent quality of life, however, in certain situations endovascular treatment may have no indication (7) (8). Under these circumstances the literature states the fact that microneurosurgical clipping remains the only viable therapeutical solution for some aneurysms (including ophthalmic artery aneurysms) (9).

Case report

The patient we are reporting is a 49 year old female who suffered a sudden loss of consciousness following strenous effort. As soon as she lost her consciousness, the patient suffered generalized tonic-clonic seizures followed by neck stiffness and vomiting. The patient was transported to the hospital and was admitted to the neurosurgical ward of the local hospital, where, after a computed tomography she was diagnosed with Hunt&Hess III subarachnoid hemorrhage possibly following the rupture of an intracranial aneurysm. The patient was overweight, suffered from arterial hypertension, hyperthyroidism and manifested recurrent headache and photophobia for more than a year. She admitted with a Glasgow Coma Score (GCS) of 12. (Motor response: 6p, Verbal response: 3p, Eye response: 3p)

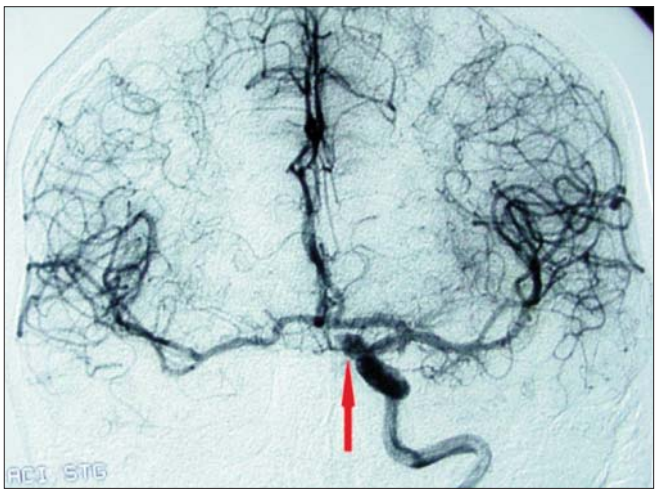

Figure 1. *The patient's DSA showing a 3.2 mm (neck) x 7.8 mm (apex) left ophthalmic artery aneurysm. Note the hypoplastic right ICA*

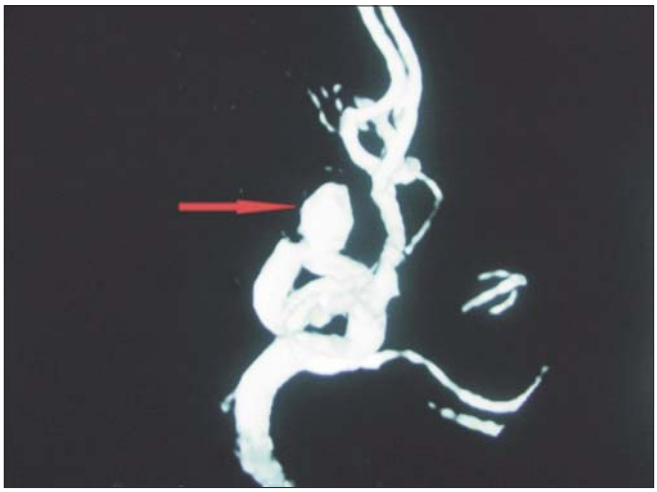

Figure 2. *The patient's angio CT showing the left ophthalmic artery aneurysm*

The patient was transferred to our hospital where additional investigations confirmed the diagnosis of ruptured left ophthalmic artery aneurysm. The patient was then redirected to the interventional neuroradiology department where a digital substraction angiography (DSA) was performed in order to prepare the patient for endovascular embolization. The DSA (See Fig. 1 and 2) confirmed the presence of a left ophthalmic artery aneurysm, however as the embolization team was not available, the decision to operate the patient was taken. The risk of anaesthesia and surgery was explained to the family the patient was transported to the OR. This took place 72 hours after rupture.

We performed a large left-pterional bone flap and a wide dissection of the Sylvian fissure thus exposing the middle cerebral artery which was followed to the base of the skull. A catheter was inserted into the left lateral ventricle of the patient

Figure 3. *The patient's DSA showing perfect aneurysm obliteration*

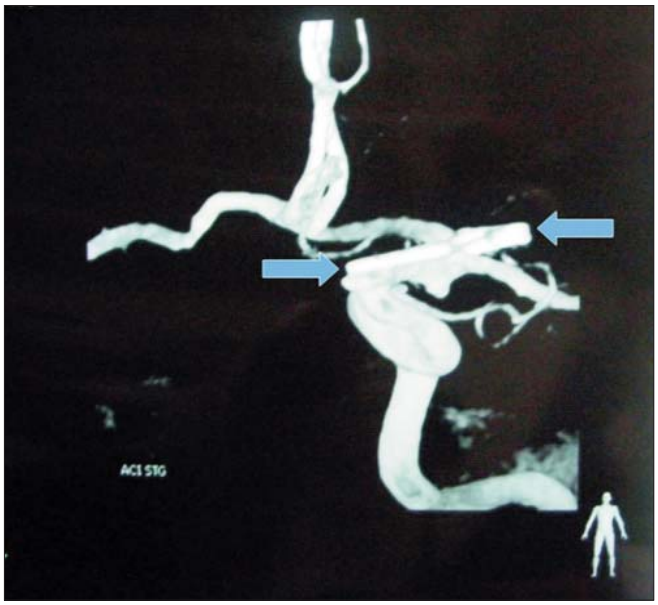

Figure 4. *The patient's angio CT showing the position of the clip. Note the complete obliteration of the aneurysm*

which granted additional maneuver space in the patient's skull-base. We carried out left anterior clinoidectomy and optic canal unroofing as it is the safest technique to expose the aneurysm and subsequently dissect it (10,11). The emphasis was placed on continuous irrigation and short breaks to prevent thermal injury to the optic nerve. Optic canal unroofing was executed with a 1 mm. Kerrison punch as the local anatomy allows some maneuver space. Extreme care must be taken not to damage local arteries or the optic nerve. As soon as the arachnoid adherences to the left optic nerve were dissected (using a microsurgical dissector) and the neck of the aneurysm was completely exposed we applied a 10 mm Yasargil clip on the neck of the aneurysm. The clip was applied parallel to the ophthalmic artery.

One day after surgery the patient's angio-CT which showed adequate blood flow in the Circle of Willis and a patent left ophthalmic artery. The postop evolution of the patient was favorable. (See Fig. 3 and 4.) As soon as she woke up from the surgery the patient was time and space aware, cooperative and without any neurologic defficit. In the postop. we administered Nimodipine (a calcium channel blocker) to prevent vasospasm. The patient was followed-up for three years with yearly asessment of neurologic function and visual function. She was reinserted professionaly and is currently under surveillance.

Discussions

Carotid artery hypoplastia is a very rare condition in the literature (12) occuring in less than 0.01% of all population (13,14,15). As far as we know there is only one other report in the literature of carotid artery hypoplasia associated with an intracranial aneurysm (14). Most patients are not symptomatic, as cerebral perfusion is compensated by collateral means, intercavernous anastomosis, communicating arteries, persistent embryologic arteries or anatomic variations (16).

The dome of the aneurysm was positioned beneath the optic chiasmus and came in contact with the left optic nerve. The neck of the aneurysm was hidden from sight by the left anterior clinoid process. As soon as the left anterior clinoid process was drilled, out the ceiling of the optic canal was opened and the optic nerve could be mobilized to allow access to the neck of the aneurysm.

The optimal therapeutic window for the surgical intervention is within the first 24-48 hours since rupture. The patient we present was operated at 72 hours since rupture.

The optimal management scheme includes from our point of view a CT exam, admission to a neurosurgical ward able to handle vascular neurosurgical emergencies and patient examination using Angio-MR or Angio-CT for diagnosis confirmation and surgical planning. Although endovascular embolization is a relatively safe procedure for some aneurysms, the patient's disease and the associated pathology prevented an endovascular approach – thus, the only viable solution was open microsurgery. (17)

The particularity of the case lies in the fact that the patient had a hypoplastic right ICA which was associated with an Ophthalmic Artery aneurysm. Complications of open microsurgery range from headache to aphasia, frontal lobe syndrome and in extreme cases even blindness if the clip is positioned poorly in such a manner that would affect the ophthalmic artery. To avoid postop complications an adequate dissection of the aneurysm neck must be conducted so that all elements in the vecinity of the aneurysm are appropriately seen and not damaged.

In the case we present, given the fact that the embolization team was unavailable, open microsurgery was mandatory as it represented the patient's only chance for a favorable outcome. Unlike many neurosurgical centers in Western Europe and the US where endovascular approaches have overtaken microsurgery, in Romania open microsurgery is preffered to endovascular embolization as it allows neurosurgeons to perfectly control the environment in which they operate and minimizes

possible complications of coiling or stenting who become more and more frequent in other countries. (17)

Conclusions

Although over the last years focus was placed on endovascular treatment of intracranial aneurysms, microsurgery is sometimes mandatory and may be the patient's only chance for survival; therefore a thourough training in open microsurgery for vascular neurosurgeons is mandatory. Furthermore, as more and more neurosurgical departments become dependant on the availability of an embolization team, a proper training in open microneurosurgery for vascular malformations may be the best fail-safe in cases such as the one we present, where an embolization team may be unavailable and the patient is in critical condition.

Carotid hypoplastia is a very rare condition which renders endovascular treatment incapable of resolving the patient's condition; associated pathology of such patients must always be considered and the correct treatment for such patients must be determined at whole surgical team level.

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