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Combined treatment of a giant anterior skull base meningioma

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Introduction

Meningiomas are tumors developed from arachnoid cells, and represent 20% of all intracranial tumors, from which 6% are located at the anterior skull base. Incidence is higher in female population, with an age peak in the fifth and sixth decade. Regarding anterior skull base meningiomas, 3,6% have the dural attachment at the level of tuberculum sellae and 3% at the olfactory groove. These tumors may invade the surrounding structures, such as dura mater and bone.These tumors are vascularized by ethmoidal arteries and rarely by frontopolar branches.

Case presentation

A 65 years old female, having cardiovascular pathology associated was admitted to our department for memory disorders (in particular short-term memory), urinary incontinence and bilateral anosmia with 1 year onset. For this reason, the patient was initial diagnosed with dementia. For the last 3 months, the condition of the patient is deteriorating, with behavioral changes, headache and visual symptoms (decreased visual acuity, lack of campimetry).

Non contrast CT scan revealed a well circumscribed low density formation without calcifications located in the frontal cranial fossa that invades the right ethmoidal air cells. The MRI with contrast scan, highlighted an anterior skull base meningioma, well vascularized with very little brain edema and erosion of the cribriform plate. Tumor insertion is located at the olfactory groove with extension in the planum sphenoidale and tuberculum sellae.

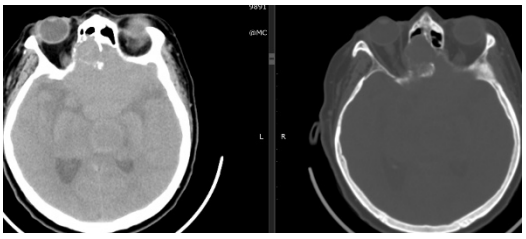

Figure 1 - non-contrast CT scan -giant tumor with right ethmoidal cells infiltration

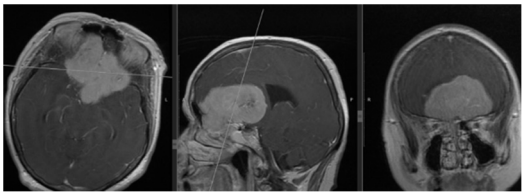

Figure 2 - MRI T1 with contrast 7/7,83/7,49cm size tumor

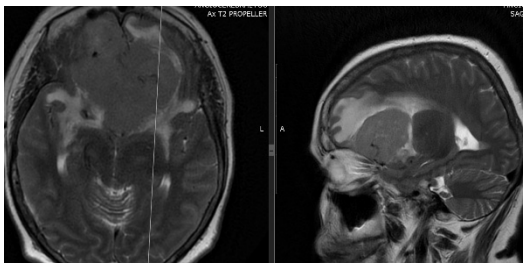

Figure 3 - T2 –MRI intratumoral arterial pedicles

For better understanding of the tumoral vascular supply, an angiographic exploration has been achieved. Righ internal carotid artery contrast injection pointed out a significant posterior shift of the anterior cerebral artery and few small branches from ophthalmic artery that supply the tumor.

Left carotid artery showed the same anterior cerebral artery displacement, and a major tumoral pedicle from ethmoidal branches of the ophthalmic artery, with important tumoral blush. From the external carotid artery, there were no arterial intake.

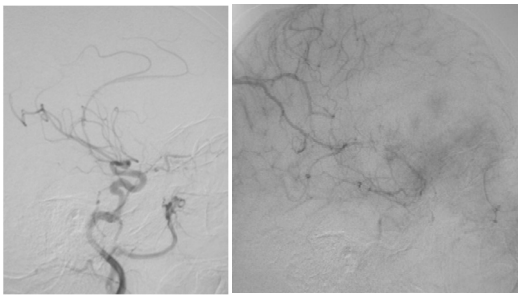

Figure 4 - right carotid artery DSA (arterial and venous phase) small pedicles from ophthalmic artery with no important tumoral blush
ACA displacement

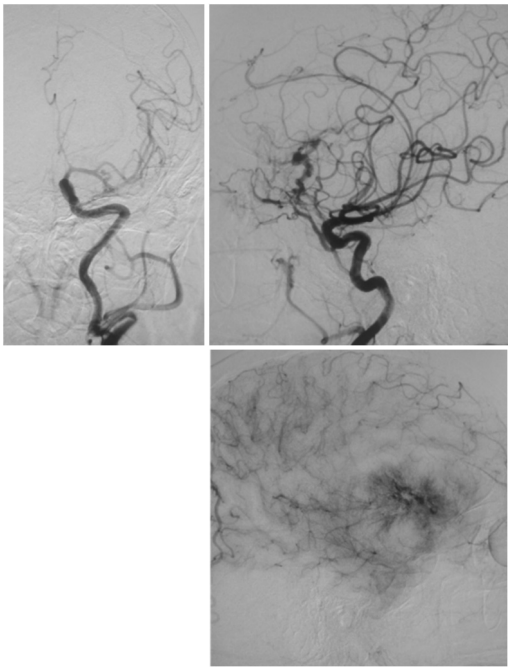

Figure 5 - left internal carotid artery DSA-major ethmoidal artery contribution important tumoral blush

We decided that the major arterial contribution from ethmoidal artery should be closed with liquid agents (glue n-butyl-2-cyanoacrylate). After embolization patient declared decreased visual acuity until only light perception on the left eye, important headache and confusional periods. Comparative CT scan pre and post embolization showed no semnificative modifications.

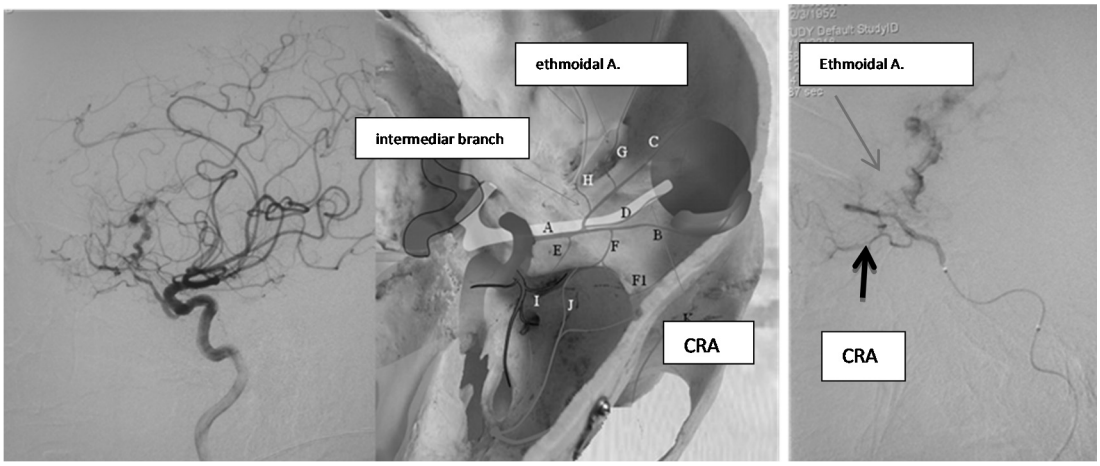

Figure 6 - left ICA DSA; CRA-central retinal artery ophthalmic artery anatomy; pedicular contrast injection

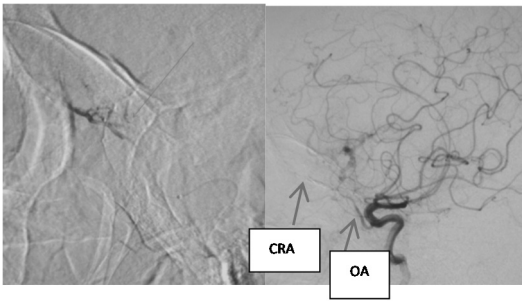

Figure 7 - glue injection

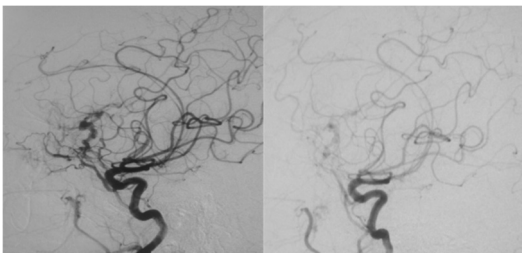

Figure 8 - pre/post glue occlusion of the ethmoidal artery

Period between embolization and surgical resection was of 6 days.

Tumor resection has been achieved through a bifrontal approach. Intraoperative, the right side of the tumor was relatively well vascularized, while the left side it was almost no bloody, clearly delimited, white colored. Subtotal resection of the tumor was achieved with CUSA (intraethmoidal part was left in place), with coagulation of the dural insertion at the cribriform plate, wax coating and anterior base reconstruction with vascularized pericranial flap.

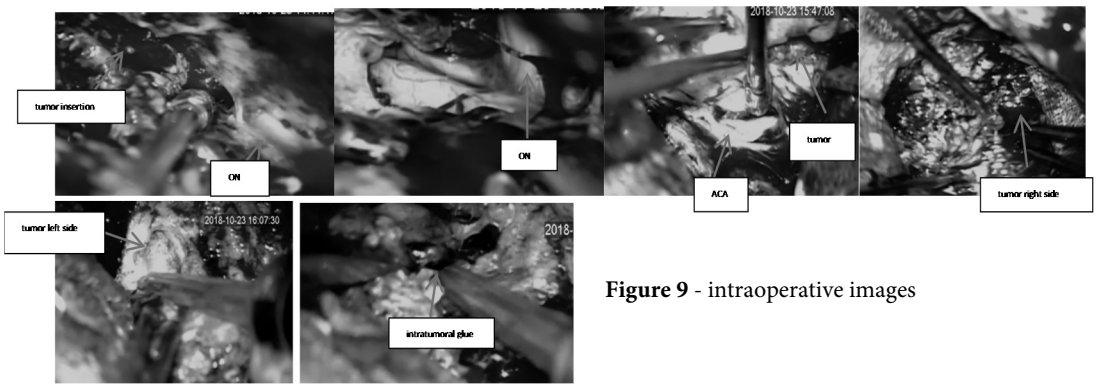

Figure 9 - intraoperative images

Postoperatively, patient develop an involution of the cognitive function (decrease of the Mini Mental State Examination with 5 points) with a good recovery during hospitalization without other complications. Postoperative CT scans (immediate and at 7 days) showed a discreet increase in size of the ventricular system.

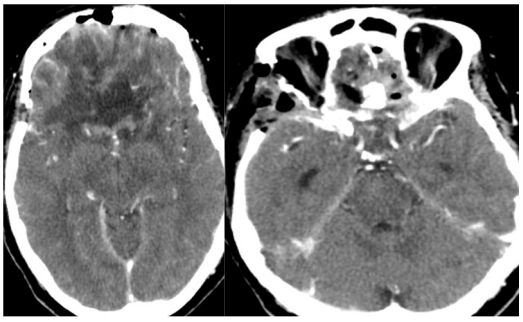

Figure 10 - postop. contrast CT scan -ethmoidal sinus remaining tumor

Definitive anatomic-pathology result was of atipic meningioma (WHO grade II)

Discussions

Embolization of ethmoidal branches from the ophthalmic artery represents a real challenge for the neurointerventional surgeon because of the high risk of ophthalmic artery occlusion and blindness. That's why a superselective catheterization of the distal branches is necessary. The highest risk with liquid agents, is that of reflux into the central retinal artery. A most reliable agent in this situation would be onyx injection because of the low precipitation rate. Complications of glue agent use are: hemorrhage, local reflux and distal delivery of emboli.

There are not many studies to report mortality rates and complications of Internal Carotid artery feeding vessels embolization, but the study of Rosen et al.demonstrates an overall complication rate of 21% in this cases.

In giant meningioma reducing blood supply it's necessary by facilitating tumor resection (Simpson I and II). In skull base meningiomas, control and access of the vascular pedicles are difficult and are accessible only after at least a subtotal resection has been achieved. Complications which could appear during or after embolization are: intratumoral hemorrhage (due to intratumoral necrosis or rupture of fragile vessels) , retinal artery occlusion or tumor swelling.

In general, the indications for embolization of the tumors are: very vascularized tumors, deep and hardly accessible arterial intake,eloquent area location, tumor with the diameter over 3-4 cm.

Regarding the optimal period of time necessary for safe resection of the tumor after embolization, studies vary, with a mean period of 7 days.

Conclusions

Giant anterior skull base meningiomas represent a challenge for every neurosurgeon, starting from choosing the most advantageous approach, total tumor resection with minimal complications and a long term lower recurrence rate. Preoperative embolization decreases surgical mortality and morbidity and increase the probability of total tumor resection.

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