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Case Report

The role of preoperative angiography in the management of giant meningiomas associated to vascular malformation

Fabio Papacci, Alessandro Pedicelli[1], Nicola Montano

Department of Neurosurgery, Institute of Neurosurgery, Catholic University, [1]Department of Interventional Radiology, Institute of Radiology, Catholic University, Rome, Italy

E-mail: Fabio Papacci - fpapirio@hotmail.com; Alessandro Pedicelli - apedicelli@rm.unicatt.it; *Nicola Montano - nicolamontanomd@yahoo.it
*Corresponding author

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Abstract

Background: The role of preoperative digital subtraction angiography (DSA) in meningiomas is currently under discussion because of the introduction of noninvasive magnetic resonance imaging (MRI) angiography to study vascular anatomy associated to the tumor. Preoperative DSA is mainly performed to obtain embolization of the lesion, although a number of complications have been reported after this procedure. Nonetheless, the coexistence of meningiomas with vascular malformations has previously been reported and it has been evidenced that this event could be underestimated because of neglect of preoperative DSA. Here, we report on two challenging cases of giant meningiomas associated to vascular malformations and we discuss the pertinent literature.

Case Descriptions: In the first case: A large right temporal meningioma with erosion of the sphenoid greater wing and extension toward infratemporal fossa and right orbit - a large pseudoaneurysm of right middle cerebral artery branch was found end embolized during DSA. In the second case: A giant parieto-temporal meningioma - DSA permitted the full visualization of an abnormal drainage of superior sagittal sinus like a “sinus pericranii” that was respected during the following surgery.

Conclusion: We think that MRI angiography is the exam of choice to study vascular anatomy in meningiomas. Nonetheless, DSA remains a useful tool in giant meningiomas not only to embolizate the lesion but also to treat tumor associated vascular malformation and to achieve the full knowledge of vascular anatomy. We think that a wide communication between interventionalist and surgeon is essential for the optimal management of these patients.

Key Words: Aneurysm, diagnosis, magnetic resonance imaging, meningioma, preoperative angiography, vascular malformations

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INTRODUCTION

The usefulness of preoperative digital subtraction angiography (DSA) in meningiomas is currently under discussion. Its role as a diagnostic tool to study vascular abnormal anatomy associated to the tumor has been reduced because of the introduction of magnetic resonance imaging (MRI) angiography.[2] Generally, preoperative DSA is mainly performed to obtain embolization of tumor. It has been reported that this

procedure, obliterating one or more arterial feeders to the lesion, facilitates its subsequent resection.[4] Nonetheless, a number of complications after DSA have been reported in the literature[4] However, it has recently been reported that the incidence rate of coexistence of a brain tumor and a vascular malformation may be underestimated because of neglect of preoperative DSA.[10] Here, we report on two challenging cases of giant meningiomas associated to vascular malformations and discuss the role of preoperative DSA taking into account the pertinent literature.

CASE REPORTS

Case 1

A 44-year-old female was admitted to our department because of a 3-year history of headache and a progressive worsening of right exophthalmos with a brain MRI showing a giant enhancing right temporal mass with erosion of the sphenoid greater wing and extension toward infratemporal fossa and right orbit [Figure 1a-d]. Due to the large dimensions and the invasiveness of the lesion, the patient was submitted to brain DSA with embolization of external carotid artery feeders (middle meningeal artery, accessory meningeal artery, distal sphenopalatin branches) using contour particles (150–350 micron). During the procedure, a large pseudoaneurysm of right middle cerebral artery branch was evident and embolized using Glubran2 glue [Figure 1e-h].

No complication after the DSA was evident. Thus, 3 days later the patient underwent tumor removal by frontotemporal-transzygomatic approach. Postoperative course was uneventful. Histological diagnosis was meningioma (World Health Organization [WHO] I). The patient is in good clinical conditions with no recurrence of meningioma at 3-year follow-up.

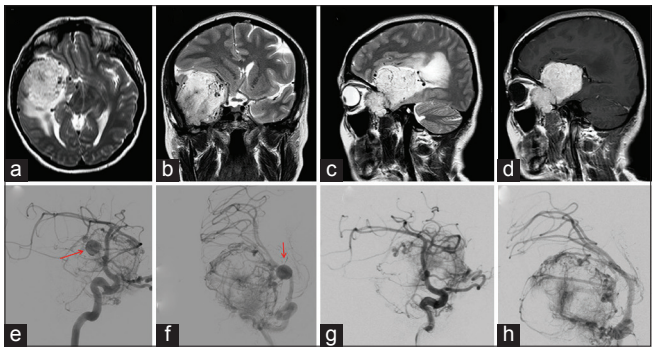

Figure 1: Axial (a), coronal (b) and sagittal (c) T2-weighted brain magnetic resonance imaging showing a large right temporal meningioma with erosion of the sphenoid greater wing and extension toward infratemporal fossa and right orbit. The tumor shows wide enhancement after Gadolinium administration (d). A pseudo-aneurysm of right middle cerebral artery branch before (e and f; red arrow) and after (g and h) embolization with Glubran2 glue

Case 2

A 50-year-old female was admitted to Emergency Department because of the onset of status epilepticus requiring intubation. Brain MRI with venous angiography showed a parietotemporal enhancing giant mass extending toward pineal region determining mass effect on brain parenchyma, compression of the ventricular system and midline shift with an abnormal vascular drainage of superior sagittal sinus [Figure 2a-c]. After starting antiepileptic therapy, the status epilepticus resolved and the patient was extubated. Neurological examination showed only a left homonymous hemianopsia. She was then submitted to DSA to better understand the vascular anatomy and embolizate the lesion. During the procedure, only the embolization of the left occipital artery using Contour particle (150–200 micron) was possible due to the deviousness of posterior and middle meningeal artery feeders; moreover, during venous phase of angiography, the abnormal drainage of superior sagittal sinus like "sinus pericranii" was clearly confirmed [Figure 2d and e]. 2 days later, she was submitted to parieto-occipital craniotomy. During the approach, great care was made to avoid a skin incision over the sinus pericranii in order to respect the venous drainage of superior sagittal sinus. Complete tumor removal was obtained. Histological diagnosis was meningioma (WHO I). Postoperative course was uneventful. She is in good neurological and general conditions at 2-year follow-up.

DISCUSSION

The role of DSA as a diagnostic tool to study vascular abnormal anatomy associated to meningiomas has been

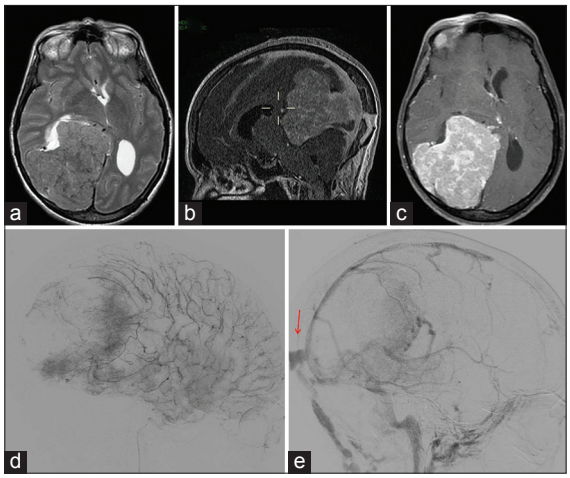

Figure 2: Axial T2-weighted (a) brain magnetic resonance imaging (MRI) showing a giant parieto-temporal meningioma enhancing after Gadolinium administration (c). Sagittal MRI venous angiography (b) evidenced an abnormal superior sagittal sinus drainage. Preoperative angiography with embolization of the lesion (d). During venous phase of angiography, the abnormal drainage of superior sagittal sinus like "sinus pericranii" was clearly confirmed (e, red arrow)

reduced due to the introduction of MRI angiography.[2] DSA is currently used to manage meningiomas with the aim of facilitating internal debulking of the tumor by decreasing intraoperative bleeding and softening the lesion. The most common reported indication is a large convexity meningioma showing high vascularization with most of feeders by the external carotid artery.[2] It has been evidenced how the complete preoperative embolization is effective on the control of blood loss during subsequent surgery.[1] Nevertheless, preoperative DSA in the head and in the neck region is associated with infrequent but potentially serious complications.[7,8] Recent published series have reported complication rates of approximately 6% in patients undergoing preoperative meningioma embolization.[4] Bendszus *et al*.,[1] analyzing their series of 185 patients, reported that 12 of them (6.5%) presented an ischemic or hemorrhagic event (in 7 patients a resolution was observed in few days). Similarly, Carli *et al*.,[3] in a series of 198 cases of meningiomas embolization, showed an incidence of complications of 5.6%. Although few cases have been reported, documenting the association between brain tumors and vascular malformations,[5-7,9] and the estimated incidence seems to be low ranging from 0.3% to 0.7%,[5,9] meningioma is the most common tumor showing such an association. Moreover, it has recently been reported that the incidence rate of coexistence of a brain tumor and a vascular malformation may be underestimated because of neglect of preoperative DSA.[10] Thus, a question exists about the correct indication of preoperative DSA in meningiomas. Here, we report on two challenging cases where a multidisciplinary approach was essential for the management of these patients. In the first case, the patient came to our attention from a peripheral hospital with a brain MRI without angiography sequences. However, according to the neuroradiologist, DSA was needed as the tumor appeared on MRI as a complex lesion due to its large dimensions and invasiveness. During the procedure, a large pseudoaneurysm of right middle cerebral artery branch was found and treated making the subsequent surgical resection safer. In the second case, DSA permitted the full visualization and correct diagnosis of an abnormal drainage of superior sagittal sinus like a "sinus pericranii" that was respected during the following surgery. According to a recent review on this topic,[10] we suggest that preoperative magnetic resonance angiography should be routinely performed in patients with meningiomas, not only to study neoplastic vascularization but also to evidence incidental vascular malformations. However, DSA should be taken into account, as an adjunct to MRI angiography, when performing a preoperative evaluation of surgical anatomy, especially in cases of giant meningiomas, as in our patients, because of the complex surgical anatomy of these lesions. DSA should be considered as an useful tool in all questionable cases, not only to embolizate the lesion but also to treat tumor associated vascular malformation and to achieve the full knowledge of vascular anatomy in order to perform the correct surgical approach and to make the surgery on these lesions less risky avoiding unnecessary blood loss.

CONCLUSION

We think that a wide communication between interventionalist and surgeon is essential for the optimal management of these patients in order to identify the appropriate cases to submit to DSA and to avoid the misuse of this procedure that is associated to rare but potentially serious complications.

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