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Case Report

A rare case of multiple meningiomas with different histology

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Abstract

Meningiomas are generally benign tumors but sometimes they manifest tendency to progress towards malignancy. It is not yet clear if anaplastic meningiomas have an innate malignancy characteristic, or an initially beginning histological appearance that degenerates malignantly in time. According to literature data, the risk of a benign meningioma to progress towards malignant phenotype is about 0.16-2%, such malignant transformation occurring after a variable period of time (2-16 years).

A still unanswered question is how many of the malignant meningiomas present this appearance as an innate feature and how many of them originate from benign meningiomas. Multiple meningiomas are defined as the presence of two or more distinct meningiomas. They occur in 6-10% of all patients that present meningiomas. Multiple meningiomas with a distinct histological appearance are rarely discovered. They support the theory of meningiomas that develop independently in the same patient. Different histology of multiple meningiomas is found in less than a third of the patients who suffer from this pathology.

We are presenting the case of a patient with multiple meningiomas with distinct histology, one being benign and the other malignant. In connection with this case we are raising a question of therapeutic management in patients diagnosed with malignant meningiomas, namely if other possible small/ benign meningiomas should be also entirely resected.

Keywords: meningioma, multiplicity, malignant transformation

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Introduction

In the vast majority of cases (90-95%) meningiomas are benign tumors, which can sometimes present a tendency to progress histologically towards malignancy. The mechanism through which meningiomas suffer a malignant transformation is currently unclear, as well as whether anaplastic meningiomas have an innate malignancy characteristic or an initially benign histological appearance that degenerates malignantly in time.

Meningiomas represent the third most frequent group of intracranial tumors, following gliomas and metastases (1). Meningiomas represent approximately 30 – 35% of the primary intracranial tumors (tumors that develop from the tissue that normally resides inside the skull) and 15-20% of all intracranial tumors (2). Due to the fact that meningiomas originate in the arachnoid villi, these tumors can theoretically develop from any intracranial region. However, there are certain preferred locations, which are probably dependant on the concentration of arachnoid villi in particular areas, especially in the vicinity of dural venous sinuses. Therefore, the most frequent meningiomas are the parasagittal ones (17 - 20% of all intracranial meningiomas) (1), which develop adjacently to the superior sagittal sinus. Other frequently encountered locations are: falx cerebri, the cavernous sinus, tubercullum sellae, lamina cribrosa.

Since meningiomas are well-vascularized tumors, which frequently develop close to important structures (the most relevant example being the venous sinuses), the surgical intervention can be technically very difficult. Moreover, the situations in which the complete resection of the tumor cannot be realized due to intimate anatomical relations with essential anatomical structures (blood vessels, cranial nerves, brainstem) are not a rarity either. It is worth reminding that a sub-total resection significantly increases the chances of postoperative recurrence.

Case report

A 65-year old woman presented to the emergency room with left side hemiparesis and hemi hypoesthesia. The anamnesis revealed that the symptoms started approximately one month earlier but got worse 3 days prior to hospital admittance.

The neurological exam revealed a moderate left side motor deficit (3/5 MRC – movement can overcome gravity but not resistance from the examiner) with a positive Babinsky's sign and a slight constructive apraxia. There were no other neurological changes.

Cerebral MRI revealed a right hemisphere mass, approximately 70/45/63mm in size, polilobulated, with hypodense areas inside, adjacent to the falx cerebri and right side tentorium cerebelli. It presented peritumoral edema, with a mass effect on the right lateral ventricle, shifting the midline by approximately 6mm. Also, parasagittal on the right parietal side, there was a smaller (1cm) mass adjacent to the falx cerebri, visible on the coronal views (Figure 1).

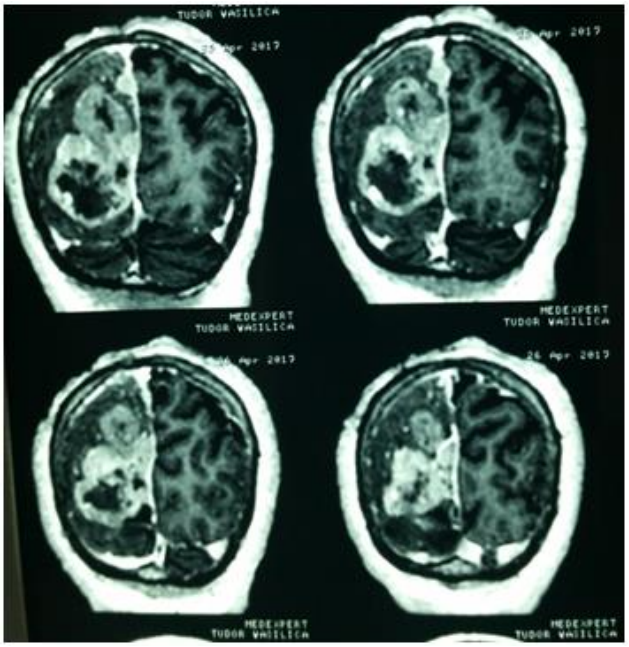

Figure 1. Preoperative enhanced CT- scan images, coronal view

More anterior in the frontal area (right parasagittal) there was another small hyperdense nodule (< 1cm), probably a third meningioma (Figure 2).

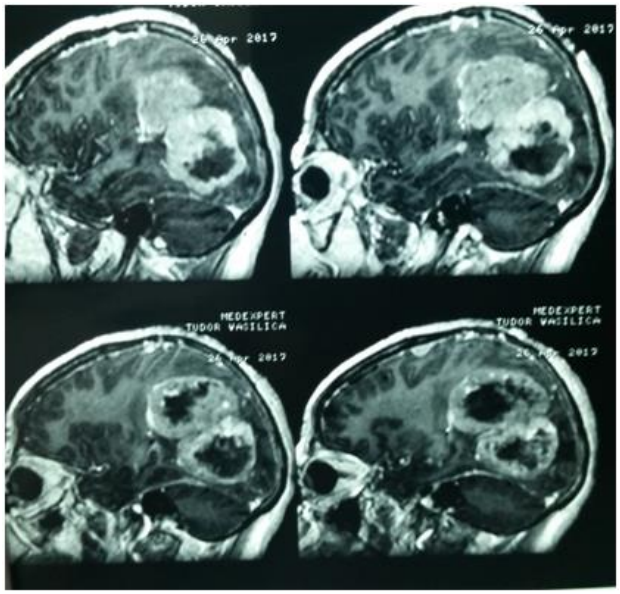

Figure 2. Preoperative enhanced CT- scan images, sagittal view

It is important to emphasize that the aspect of the large tumor, with 2 lobules, strongly attached but each one with its own necrotic center, might suggest that there were initially 2 tumors developed in close vicinity which fused while growing (Figure 3). Anyway, intraoperator it was not possible to confirm for sure this theory, so that it remains only a theoretical speculation.

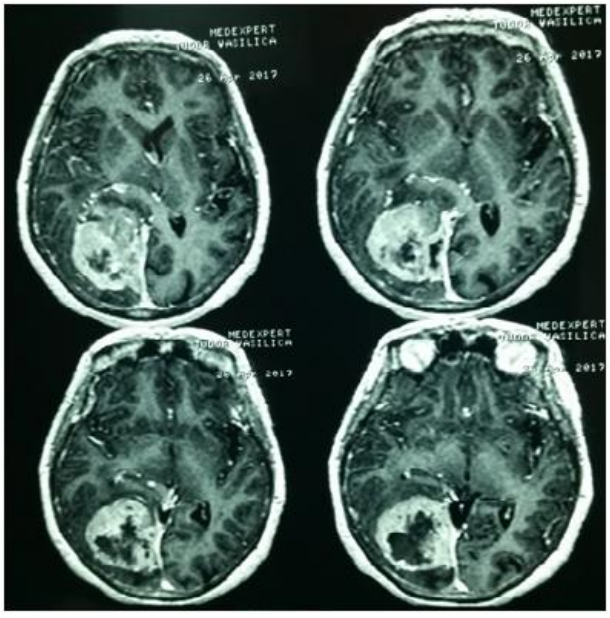

Figure 3. Preoperative enhanced CT- scan images, axial view

Surgical technique

An arcuate incision from the external occipital protuberance to the asterion was made, followed by a right side occipito-parietal craniotomy. We used an interhemispheric approach, finding an extra-axial tumor inserted on the falx cerebri, with an inhomogeneous consistency, presenting necrotic areas. The tumor was well vascularized. The center of the tumor contained a necrotic liquid, with a pus-like aspect, which we collected for bacteriology and afterwards was proven to be sterile. The insertion was coagulated, achieving a Simpson II resection of the tumor. After careful homeostasis, closure was made in a normal fashion.

In the hours immediately following the operation, the patient was extubated and presented a slight improvement of her previous neurological state. After 24 hours, her consciousness began to alter rapidly, needing intubation.

An emergency CT scan was made, showing marked parietooccipital edema, with intraparenchymal hemato-aeric accumulations, with mass effect and lateral ventricle compression, shifting the midline 12 mm to the left.

This imposed an emergency decompressive craniotomy. We initiated a standard craniotomy procedure, finding the dura mater under pronounced tension. Opening of the dura revealed marked cerebral edema, and while exploring the tumor bed, another small, approximately 1cm in size mass was found, adherent to the falx cerebri. It was completely excised, including its insertion. After careful homeostasis and closure, we made a para-umbilical linear incision, about 10cm in size, creating a pouch in the abdominal fatty tissue by digitoclasia, in which we stored the bone flap for later use.

The histopathological exam for the large tumor was compatible with an anaplastic meningioma, while the smaller lesion was a transitional meningioma.

Postoperatively, the patient's neurological state slowly improved over time. She was discharged from

the hospital 35 days after surgery. At one-month follow-up, the patient was able to speak almost normally, with the left-side hemiparesis greatly improved (4/5 MRC), giving her the ability to move with very little help. She has been subjected to postoperative radiotherapy and will be re-operated at 3 months after the initial surgery in order to restore the bone flap.

Discussions

Malignancy and recurrence

Though histologically benign, with a great potential of healing completely through radical surgery, meningiomas present a high rate of post-surgical recurrence, up to 25% in particular situations, even in cases of complete macroscopic surgical resection (2). These cases require surgical reintervention, even multiple times in some cases. In scientific literature, such cases of recurrent meningiomas that required multiple surgery, as well as histological transformations depicting malignant degeneration towards anaplastic meningiomas have been widely described (2, 3). The rate of malignant degeneration of recurrent meningiomas is 10 – 38%, as described in medical literature (3). However, a benign meningioma rarely recurs towards malignancy shortly after surgery (4). A series of genetical studies (5), based on the hypothesis that meningiomas accumulate genetic alterations in time, thereby progressing towards malignancy, have shown that genetic alterations in the methylation status of p73 or RASSF1A along with 1pLOH may result in the malignant transformation of a meningioma. This type of genetic footprint may play a key role both in diagnosis and treatment.

The risk of progression of a benign tumor towards a malignant one is, according to scientific literature, between 0.16% and 2% (2). The heterogeneous aspect of the tumor revealed by imagistic investigation usually suggests a malignant transformation (4). Furthermore, the lobulated shape and pronounced peritumoral edema are signs of a possible malignant degeneration as well (6).

In the case of anaplastic meningiomas, the prognosis is bad, the mean survival rate being approximately two years (3). The malignant transformation of benign meningiomas is a process that occurs with a frequency that is currently difficult to estimate, but according to recent studies, when it does occur, this process can take 2 up to 16 years (2, 3, 6). Scientific literature has reported cases of benign meningiomas which recurred shortly after surgery, sometimes even before one year, and which have been proven as malignant by the anatomopathological examination, after the second surgery took place (7). Other cases have presented multiple recurrences, and only in the third or even fourth surgery, the meningiomas have presented malignancy features (3, 8).

There is no clear data regarding the incidence of malignant transformations of recurrent meningiomas. What is known for sure is the fact that patients who underwent subtotal meningioma resection, in spite of having a higher rate of recurrence and having suffered more surgeries in time comparing to those with complete resections, did not have a lower average life expectancy than the last ones (9). This fact suggests that malignant transformation of benign meningiomas is a quite rare phenomenon, this idea being confirmed by the very low proportion (5%) of anaplastic meningiomas (10).

A still unanswered question is how many of the malignant meningiomas present this appearance as an innate feature and how many of them originate from benign meningiomas that showed a malignant degeneration in time.

Multiple meningiomas

Multiple meningiomas are defined as the presence of two or more distinct meningiomas. Confluent or cluster meningiomas refer to diffuse meningiomatosis, which is an extreme form of multiple meningiomas (1). Multiple meningiomas occur in 6-10% of all

patients that present meningiomas (11). Frequently, multiple meningiomas occur in neurofibromatosis. The difference between real multiple meningiomas and those that occur in von Recklinghausen disease isn't always clear (12).

The causes of occurrence of multiple meningiomas are still debated. The dissemination of tumoral cells through the venous system or through the cerebrospinal fluid has been taken into consideration as a possible etiological factor (13). In some cases, molecular analyses have shown that multiple meningiomas associate a loss of the same copy of chromosome 22 or an inactivation of the same X chromosome, supporting the hypothesis according to which tumors originate in the same clone cells (5, 8). Another theory supports the existence of neoplastic multicentric foci, depicting tumors that develop independently from one another (7).

Multiple meningiomas with a distinct histological appearance rarely occur. They support the aforementioned theory of meningiomas that develop independently in the same patient. Different histology of multiple meningiomas is found in less than a third of the patients who suffer from this pathology (14).

Conclusions

The case that we're about to present depicts a rare situation of coexistence of histopathologically different meningiomas, and, much more than this, of a benign meningioma coexisting with a malignant one. A practical problem of therapeutic attitude in such cases of multiple meningiomas is linked to the management of remaining meningiomas after the resection of a malignant one, even if they have a reduced size and present a clearly benign appearance. Considering that it's very likely that the malignant meningioma originated from an initially benign, apparently harmless meningioma, is the resection of the remaining meningiomas, though small and benign, required? Hopefully, the answer will be given by further scientific research.

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