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Article

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Cerebellar metastases – may surgery play a role in the presence of multiple lesions?

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Abstract: Brain metastases are the most common form of malignancy presence in the CNS having a more frequent appearance than primary brain tumors. Although secondary cerebellar tumors represent only 15% of all intracranial metastases, they are quite frequent among primary oncological patients and pose a challenge for all of the medical caretakers starting with the neurosurgeon. Among those, a small percent of patients have multiple cerebellar lesions and the therapeutic challenge turns into a medical controversy, especially when it comes to surgical treatment taking into consideration that the life expectancy is lower than one year. A key asset which we have on our side is the anatomical vicinity these lesions occur, this leading us to take into consideration eliminating as many lesions in one single operative time as possible without changing the position of the head during surgery. Based on a retrospective study which concluded that patients with resection of all lesions tend to have a longer life expectancy, and on modern concepts of risks and benefits of oncological surgery and surgery in general, we followed up on three patients presenting posterior and even multiple posterior fossa metastases, taking into consideration individual comorbidities, tumor aspects and the possibility/opportunity of surgical treatment. It turned out that surgery is a safe and effective treatment option and should not be considered harmful or aggressive especially because all of the patients which were under study had a favorable post-operative prognostic and an improved quality of life. We emphasize furthermore the importance of complete lesion resection in as few interventions as possible followed up by radiotherapy/chemotherapy as a key in prolonging these patients life expectancy taking into consideration that the outcome is directly related to the number of lesions rather to the location or volume of them.

Key words: cerebellar metastases, multiple metastases, controversy, complete surgical resection, life expectancy, number vs volume/location

Introduction

Brain metastases represent very common complications of different types of cancer, and they are the most frequent brain tumors. In autopsy studies in patients with various types of malignancies, one quarter of them presented intracranial secondary tumors (1). The incidence of these tumors increases due to the accessibility and improvements of imaging explorations and to the impressive development of the treatment (surgical and oncological) of the primary tumors (2). The most common primary cancers which spread into brain are lung cancer (25-30%), breast (22-25%), melanoma (11%), renal (<5%), uterine cancer (<5%) (3).The surgery has its role in the management of cerebral metastases, due to rapid clinical improvement, diagnosis, local control and relief from corticosteroid dependence (5).

Cerebellar secondary tumors represent only 15% off all the intracranial metastases (4). Cerebellar metastases have some specific features and additional risks: they are not very well tolerated and they have a bad prognosis compared to cerebral lesions, because they can obstruct the CSF pathways and lead to hydrocephalus, they can produce tonsils herniation, brainstem compression and finally sudden death. It is why the surgical indication is easier to consider, and an emergency procedure is not quite rare.

Is there any place for surgery in patients with multiple metastases, one or more being in posterior fossa? This issue remains a controversial one, and unfortunately there are not randomized studies to support some solid evidence based conclusion. However there is a retrospective review which emphasizes the importance of the resection of all discovered lesions (6). According to the authors of this study if all the lesions were resected, the survival period was significantly longer (median 14 month) than in the cases with partial resection (median 6 month) (p=0.003). In some cases it is possible to do resection of supra- and infratentorial lesions in the same surgery, in the same operative position of the patient. In the current paper we present some cases of patients in which we have performed a surgery for posterior fossa metastases, even multiple cerebral lesions were present.

Case presentation 1

The first case is of a 37 years old female diagnosed with breast cancer two years before the presentation, treated with chemotherapy, with an evolution of her primary disease considered as being stable. She presented in the emergency unit with a picture of acute intracranial hypertension syndrome (severe headaches, nausea, vomiting), right hemiparesis, right homonymous hemianopsia, cerebellar syndrome, nystagmus. The MRI revealed the presence of multiple cerebral lesions – right cerebellar, right occipital and left frontal, with significant surrounding edema, typical aspects for secondary lesions (figure 1). The symptoms, right hemiparesis included, relieved rapidly after corticoid and diuretic treatment and an indication of surgery was considered.

The primary breast tumor being practically cured, without any evidence of other extracranial secondary lesions, we decided to resect all of the intracranial metastases. The larger lesion, the occipital one, and the posterior fossa tumor – with risk of tonsillar herniation – were considered to be more dangerous, so our decision was to operate them first, in the same operating position and the same general anesthesia. The suites were simple, without any complications, so after 6 days we performed our next step – the excision of the left frontal lesion. This one is somehow different from other usual cerebral metastases, it is not subcortical and the aspect was similar with falx meningiomas with large dural insertion. The evolution was favorable and the 1 month, 6 month and a year controls revealed no recurrence and no other de novo lesions (figure 2). She presents after one year for partial right motor seizures but the MRI does not reveal any pathological cerebral Gadolinium enhancements (figure 3).

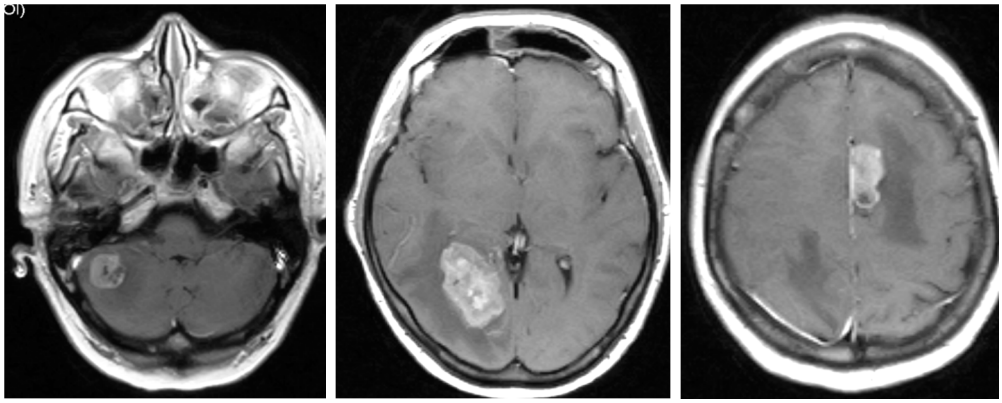

Figure 1 - MRI T1 enhanced- multiple metastases: right cerebellar, right occipital and left frontal parasagittal, significant surrounding edema

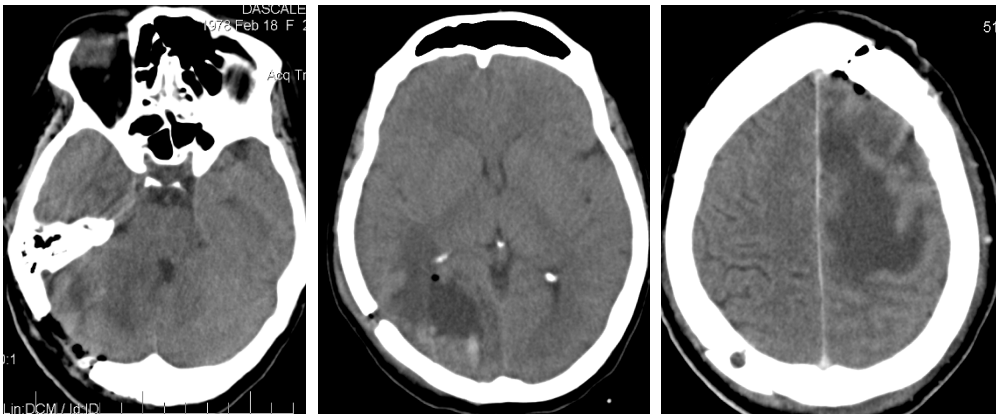

Figure 2 - Case 1 CT scan-postoperative images

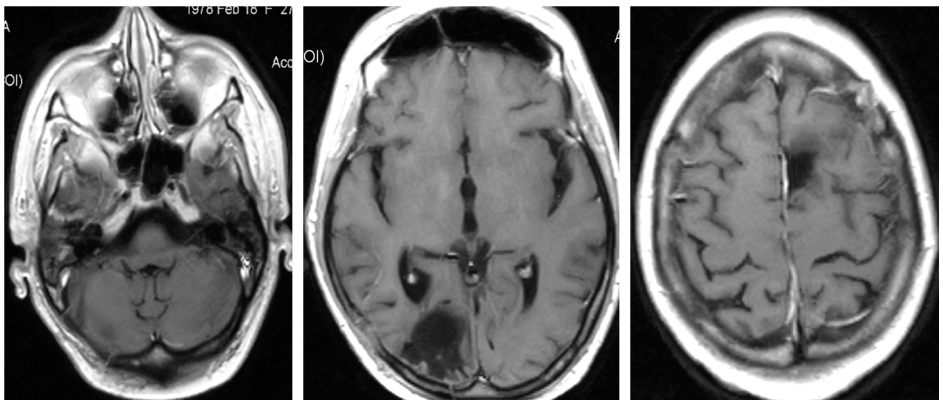

Figure 3 - Case 1 - MRI T1 Gadolinium–control at 1 year - no enhancement

Case presentation 2

Our second case is a woman, 60 years old, admitted in our hospital for headache, nausea, vertigo, somnolence, gait instability. Our patient had a history of breast cancer operated one year before current presentation with subsequent radio and chemotherapy. An MRI was performed and this one revealed two lesions, both located in the posterior fossa, one of them right cerebellar and the second in the middle of the pons (figures 4, 5). Is there any reason to do any surgery in a case like that? We had discussed sincerely with the patient and her family and we decided to operate the symptomatic and surgically approachable lesion – the cerebellar one. The evolution was favorable, the symptoms almost disappeared, and our MRI studies at 1 month, 3 month, 6 month and one year did not show any evolution of the remaining pons tumor (figures 6, 7). Unfortunately our patient died at 18 month after our surgery with pulmonary metastases discovered 6 months after the initial admission in our hospital.

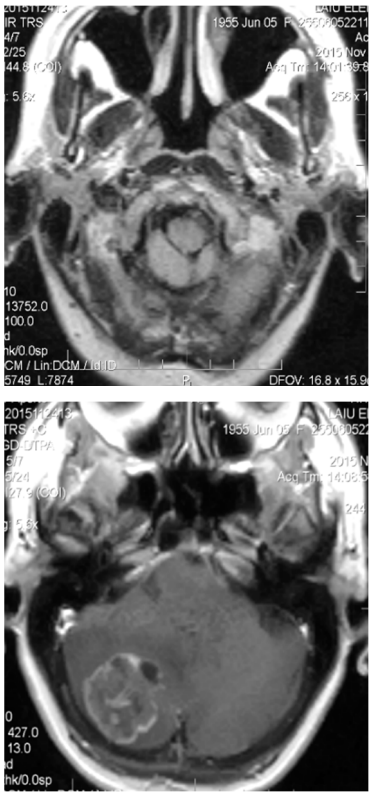

Figure 4 - Case 2 – MRI T1 enhanced-tonsils herniation due to a large lesion at the level of the right cerebellar hemisphere

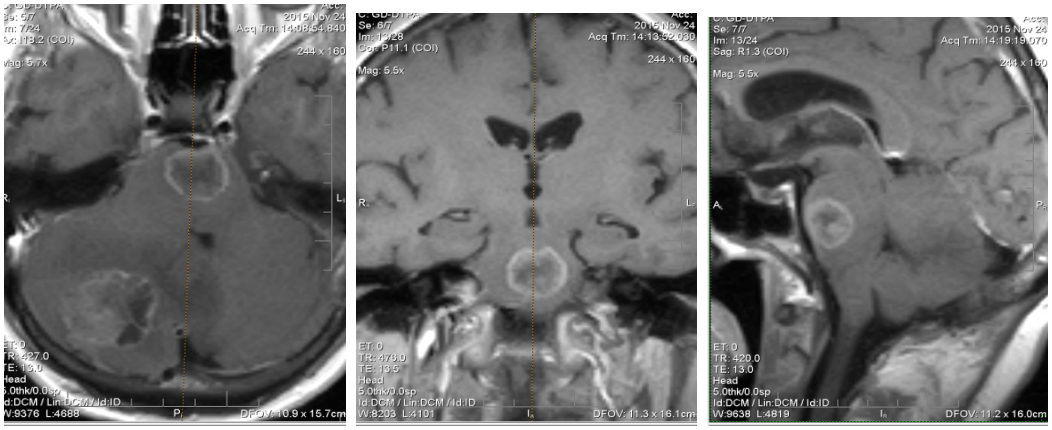

Figure 5 - Case 2 - MRI T1 enhanced – two lesions: right cerebellar and in brainstem

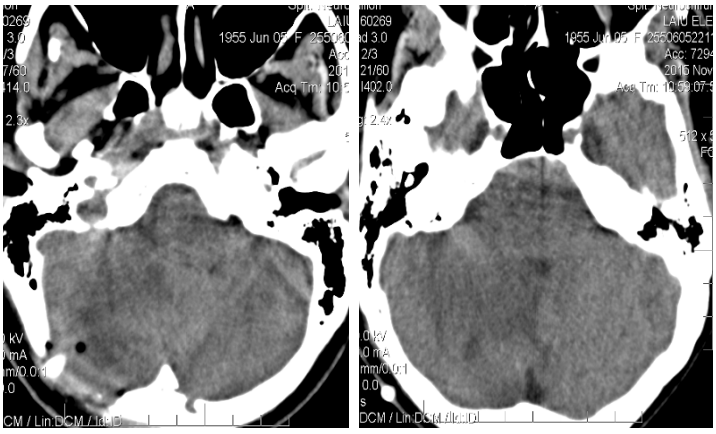

Figure 6 - Case 2 - CT scan- postoperative images

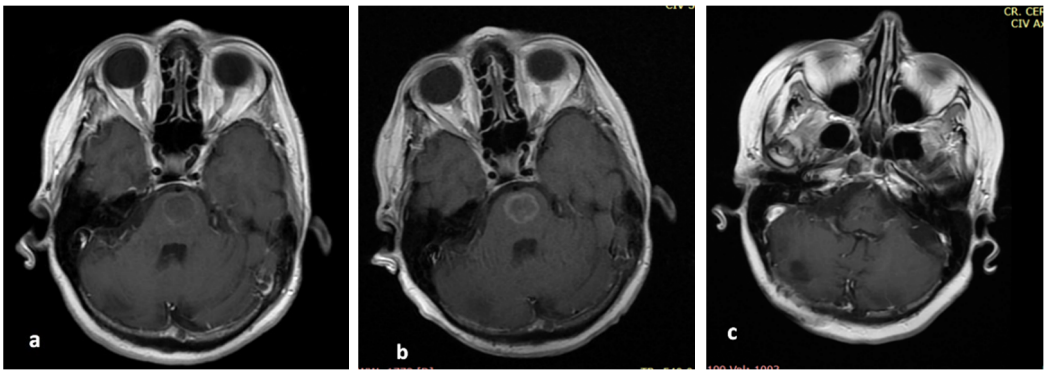

Figure 7 - Case 2 – MRI T1 enhanced control at 6 (a) and 12 month (b), no local recurrence on the surgical site at 1 year (c)

Case presentation 3

Our third case is of a male patient, 64 years old, with a history of headache, asthenia and gait disturbance for 2 weeks. It was learned from his history that he had a surgery for a skin melanoma on the right calf 2 years before. His symptoms suddenly aggravated and he was admitted in our emergency unit in coma state (GCS 7). The CT scan showed the presence of multiple, disseminated brain lesions with melanoma metastases pattern (round, spontaneous hiperdense, surrounded by edema), one of them in the right cerebellar hemisphere, being obviously the symptomatic one. This lesion had signs of intratumoral bleeding (not uncommon in melanoma metastases) which may explain the sudden aggravation of patient's clinical condition, it had mass effect on the 4th ventricle, determined tonsillar herniation in foramen magnum and active hydrocephalus (Figure 8, 9). We performed an emergency surgery– complete resection of the tumor and surrounded hemorrhage - without any complication during and after the operative procedure (figure 10). The evolution was favorable, the patient regain his state of conscience and he was addressed to the Oncological Department for further treatment.

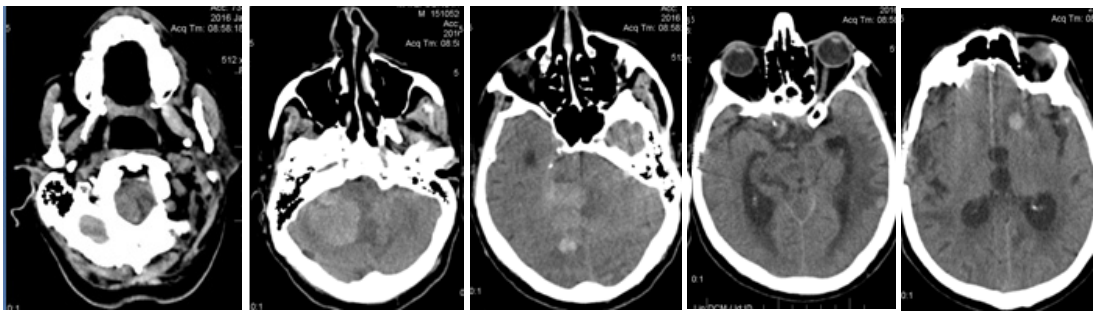

Figure 8 - Case 3 - Ct scan- right cerebral tonsil under the foramen magnum, due to intratumoral bleeding with mass effect on the ventricle 4 and supratentorial active hydrocephalus

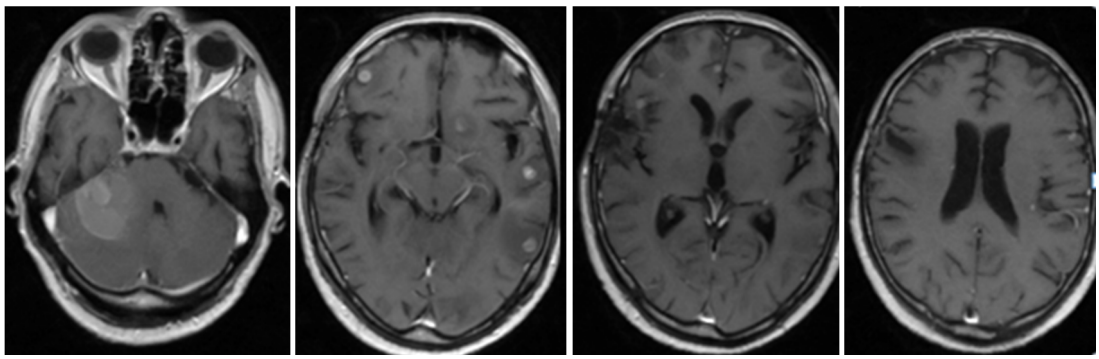

Figure 9 - Case 3 - MRI T1 enhanced: posterior fossa lesion with multiple other supratentorial lesions

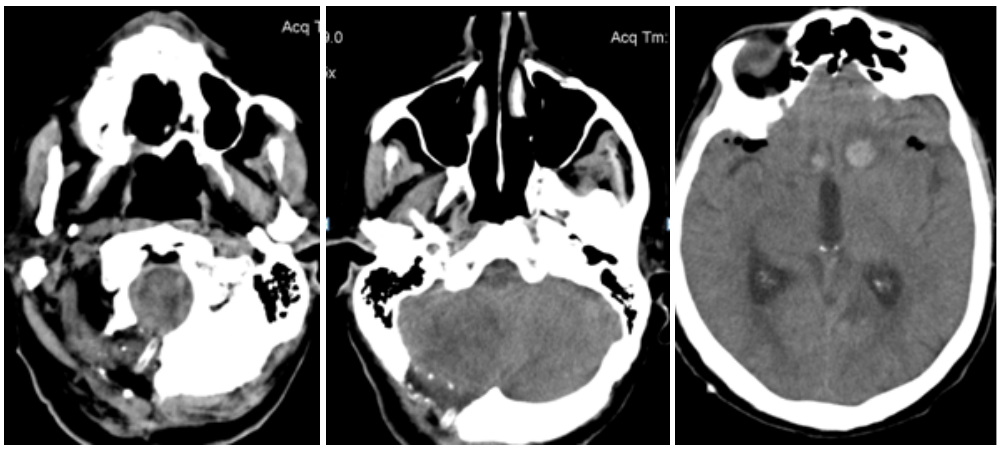

Figure 10 - Case 3 - Ct scan- postoperative images

Discussion

The prognosis of patients with brain metastases, despite all the advances in neuroimagistic, surgical and oncologic techniques, remains poor, with a median survival which rarely exceeds 2 years. With multiple cerebral metastases, the prognosis is even worse, under 1 year, and the presence of a posterior fossa lesion is an independent factor of bad evolution.

Nevertheless the aim of this paper is to emphasize that surgery still have an important role in the management of this difficult and sad field of oncology – metastatic disease. In solitary intracranial lesions, the resection plus postoperative whole brain radiotherapy is the best treatment option, and the recommendation is made by a landmark randomized study with class I evidence support (7). The goal is to obtain symptom relief, histological confirmation, local control, finally to get a longer survival with a good quality of life for the patients. We consider that it is almost always possible to do a surgical resection, most of the lesions being well defined, easy to resect, easy to find with the aid of neuronavigation, stereotactic techniques, ultrasonography and we are able now to preserve the neurological status by means of tractography, cortical stimulation and awake surgery. We talk about a surgery that, in experienced hands, is not very difficult, it gives a longer survival to our patients, we can preserve a proper quality of life, but, of course, some limits may be the initial performance status, age, extend of the cancer and the control of the primary tumor, number of cerebral lesions, time interval between diagnosis of the primary tumor and development of cerebral lesions, life expectancy (8, 9).

In the presence of multiple intracranial lesions, the surgical indication is a subject of controversies. There are some situations like a large tumor, with obvious mass effect, or situated in the posterior fossa with tonsillar herniation and obstructive hydrocephalus, that can be considered emergency situations,

despite the presence of other intracranial lesions and the indication will be the resection of the threatening lesion, followed by chemotherapy and radiotherapy. This is the case of our third patient operated in emergency because of his life threatening lesion and sudden neurological deterioration. Our second patient had one lesion very difficult to resect surgically but another one with immediate life threatening. We consider that the resection of that tumor was justified and this option prolonged the life of our patient in good quality of life conditions and his unfavorable evolution depended on her pulmonary condition. Another situation is a patient with well controlled primary lesion in which we find 2 or 3 cerebral metastases, all of them surgically accessible. We consider in this cases surgery as an option, in a patient with a life expectancy over 6 month, if we are able to resect all the diagnosed intracranial lesions. In this situation was our first patient in which, the resection of all the lesions had a very favorable evolution. There are class III evidence data in favor of this approach which postulate that complete surgical resection of all the lesions have results that are comparable with those obtained in single lesions (10). Surgical resection is a mainstay for the management of most brain tumor types, and when feasible, for metastatic brain tumors, being associated with better outcomes and quality of life (11).

In some cases the resection of 2 or 3 lesions is possible in the same anesthesia, without changing the positioning of the patient during the procedure. In our cases (case no. 1) that was possible in cerebellar lesions associated with occipital or even frontal ones. The patient was placed in a prone position which allows both supra- and subtentorial surgeries. As we often experienced, placing the patient in prone position favors cerebral edema, so the resection of the occipital lesion may be influenced by this brain swelling. This is why in all our cases we started the surgery with the cerebellar resection which allows CSF drainage and gives us more comfort in the second part of our procedure. However we have to keep in mind that this CSF drainage may produce some shifting that will affect the navigation system precision. Anyway, in this cases we can use the real time precision of ultrasonography.

Conclusion

We believe that surgery is a safe and effective procedure for cerebral metastases and should not be considered an aggressive treatment in such diseases because is relatively easy to perform, it should not add supplementary neurological deficits, it can relieve intracranial hypertension and assure local control. Good performance status– score Karnofsky (KPS >70), number of brain metastases, extracranial metastases, treatment pattern-adjuvant radiotherapy and/ or chemotherapy are independent significant prognostic factors. We emphasized the importance of complete resection in operating and results of some other studies (12, 13) revealed that complete resection significant prolonged patient's median survival time. Most evidence describing outcomes of patients with brain metastases is based on the number of brain metastases, rather than location or volume (14).

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