Diffuse brain swelling following falcine meningioma surgery

Inchaço cerebral difuso após ressecção de meningeoma falcino

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ABSTRACT

Initially described by Harvey Cushing at the beginning of the last century, meningioma is used for tumors that originate from meningothelial cells of the arachnoid, are usually well-circumscribed, slow growing and amenable to complete resection. The presence of peritumoral edema in meningiomas is known for a long time and has been studied regarding its etiology. The peritumoral edema can lead to technical difficulties during treatment as a limitation of the surgical field when the swelling is extensive. The present study describes a case of a patient who developed severe and persistent neurological impairment due to diffuse cerebral swelling after resection of parasagittal meningioma without complications perioperatively.

Keywords: Meningioma, cerebral swelling, peritumoral edema.

INTRODUCTION

Initially described by Harvey Cushing at the beginning of the past century, the term meningioma is used to describe tumors which originate from the arachnoid meningothelial cells¹. They account for approximately 15% of all intracranial tumors and occur preferentially between the fourth and sixth decades of one’s life, affecting mainly women. Fortunately, most cases follow a benign clinical course, and some are asymptomatic. Meningiomas are generally well-circumscribed, slow-growing and are prone to total resection. 4 However, the biological behavior in each meningioma varies, mainly according to its capacity of both invading adjacent tissues and producing perilesional swellin⁷.

The presence of peritumoral swelling in meningiomas has been known for a long time and been an object of study regarding its etiology. Peritumoral swelling may result in technical difficulties throughout treatment such as a limitation of the surgical field when the swelling is extensive. 5 However, few studies focus on the understanding of the post-surgical peritumoral swelling after the resection of intracranial meningiomas¹.

Modern microsurgical techniques are routinely carried out. However, the progressive clinical deterioration followed by presumably ‘non-complicated’ excision may occasionally be
observed and possibly can lead to a growth of the post-surgical peritumoral swelling.

The current case report describes a patient who evolved to a severe and persistent neurological damage due to a diffuse brain swelling after parasagittal meningioma resection, with no perioperative complications.

**CASE REPORT**

M.J.L.B, 75 years old, female, progressive history of mental impairment for the period of 1 year, with progressive worsening and significant exacerbation over the past month. No history of trauma, loss of muscular strength, epileptic crisis or other complaints have been found.

Regarding the pathological history, the patient suffered from systemic arterial hypertension – controlled with medication-and diabetes mellitus. When admitted in our hospital, she had been presenting mental impairment of sudden worsening outset for 15 days and her clinical exam showed no impairments in speech, no motor or sensory deficits. Furthermore, the patient displayed exalted axial facial reflexes.

CT scan pointed out a left frontal tumoral lesion - well outlined, regular borders, estimated volume of 60 cm³, spontaneously hyperdense, with homogeneous enhancement pattern after contrast administration and intimate contact with the anterior third of the falx cerebri (Fig. 1). Magnetic Resonance Image (MRI) showed a non-infiltrative, homogeneous, well outlined expansive lesion, predominantly hypointense on T1 weighted (T1 WMR) images, isointense on T2 WMR and intensely and homogeneously gadolinium-enhanced, showing better evidence of its relationship/infiltration towards the anterior third of the falx cerebri (Fig. 2).

The patient underwent an open surgery in 10.18.2011, and a bizigomatic incision and bifrontal craniotomy was planned, with a satisfactory grade I Simpson resection, without venous or neural additional damage. No intraoperative or perioperative anesthetic or clinical complications were seen. Meanwhile, 6 hours after surgery, the patient could not recover an alert conscience status. A CT scan was performed depicting a diffuse hypodensity in the caudate, lentiform nucleus and thalamus bilaterally, associated with a congestive diffuse brain swelling (Fig. 3). After that we choose to maintain the patient with optimized continued sedation and serial CT scans showed progressive depletion of brain swelling and central core hipodensity. Even with adequate measure and treatment of intracranial hypertension, the patient developed severe and persistent neurological impairment requiring long term intensive unity care. The patient left the hospital after 3 months of admission with severe disability and Glasgow Outcome Scale (GOS) 3. The anatomophatological examination presented as...
meningothelial meningioma (WHO Grade1).

Figure 3. Diffuse hipodensity in the caudate, lentiform nucleus and thalamus bilaterally associated with a congestive diffuse brain swelling.

Figure 4. Control CT scan showed depletion of brain swelling and central core hipodensity.

**DISCUSSION**

The incidence of peritumoral swelling associated with intracranial meningiomas evaluated by pre-operative MR or CT ranges from 46-92 %. The etiology of the peritumoral vasogenic swelling has originally been described by Klatzo in 1967 and remains uncertain.

Many etiologies have been proposed to explain peritumoral brain swelling in meningiomas such as venous channels obstruction by tumor, tumoral’s venous drainage hypoplasia, ischemia due to pressure effect in large meningiomas, blood-brain barrier (BBB) dysfunction related to fluid edema diffusion and macromolecules transport along with tumoral gradient pressure and excretory/secretory mechanisms capable of inducing brain swelling development (VEGF – endothelial growth factor).²

Lunsford and cols (1979) pointed out that after gross total resection of convexity meningiomas, a multiple serial control computed tomography (CT) showed massive hemispheric enhancement compatible with luxury perfusion¹. Shirotani and cols (1994) studied the peritumoral edema related to meningioma’s resection and concluded that different patterns play a role in its evolution, varying from a small hipodensity which disappears gradually with time and even persistent forms related to peritumoral swelling and brain tissue damage⁶. Trittmacher and cols (1988), pointed out two phisiopathological mechanisms related to peritumoral hipodensity, the first been induced brain atrophy due to tumor’s mass effect and pressure and the second been related to uncertain etiology brain edema⁸.

Asgari and cols have performed a retrospective study on a series presenting progressive neurological deterioration after resection of intracranial meningiomas related to extensive brain swelling, analyzing its etiology and patient’s prognosis. A total of 376 patients was submitted to intracranial meningioma surgery, 13 (3.5%) presented post-operative neurological worsening due to extensive brain edema needing longstanding artificial ventilation, reintubation or decompressive craniectomy. Two groups have been selected between those patients. Group A (7 patients – typical venous infarction related to accidental or intentional venous occlusion) submitted to decompressive craniectomy in 6 of them, despite satisfactory results were obtained in only 2 patients (GOS >4). Group B (6 patients with progressive neurological deterioration due to uncertain mechanism), submitted to decompressive craniectomy in 3 of them, with only 1 patient obtaining unsatisfactory result (GOS<3). In contrast, 83 % of patients of group B showed a bigger tumor volume (75cm³ X 30 cm³)².

In our case report, there have been neither unadverted vessel lesions nor clinical/anesthesiological intercurrences related to the procedure. Nevertheless the patient developed severe and persistent neurological impairment (GOS3) with serial CT scans showing extensive cerebral edema, with bilateral ischemic lesions in the central core.

Even with meticulous surgical technique, a small group of patients submitted to meningioma resection is prone to develop diffuse brain swelling related to uncertain etiology and catastrophic evolution.
CONCLUSION

We have presented a case report with a Simpson I falcine meningioma resection with severe post-operative disability due to extensive brain swelling besides no evidence of structural lesions in the surgical act.

Considering the lack of evidence of physiopathological mechanism involved in the cerebral edema origin related to surgery in meningiomas, hazardous evolution can be present the clinical picture even in a scenario of a well done preoperative, intraoperative and postoperative care.

In conclusion, meticulous attention should be paid to ensure structural preservation and further analysis are needed to understand the true etiology of brain edema in such cases to avoid future complications in similar cases.

REFERENCES


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