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Complications of a posterior fossa post-surgical patient, review of a case

Abstract

The anesthetic and intensive care unit (ICU) management of patients undergoing posterior fossa neurosurgical procedures represents a true challenge due to the particular anatomy of this region, the vital structures adjacent to it and the possible complications derived from both the intervention itself (surgical) as well as the failed extubation, post-obstructive edema (due to pressure differences in the airway), the absence of swallowing and cough reflexes, mean that the (therapeutic) management is carried out in an optimal, with proper monitoring and decision-making in accordance with the situation. Below is a clinical case of a woman operated on for a posterior fossa tumor who presented airway complications and failed extubation.

Keywords: intensive therapy, anesthetic management, airway, posterior fossa

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Introduction

The posterior cranial fossa is formed by the dorsum of the sella turcica and the clivus, laterally by the petrosal bone and the mastoid bone of the temporal bone, the superior limit is the tentorium cerebelli and the posteroinferior is the bone. The foramen magnum, located in the occipital bone, is the largest opening of the posterior fossa that contains important structures such as the brainstem, cerebellum, and lower cranial nerves. In the area of the pons and medulla oblongata, the main nuclei are found, the real origins of the cranial nerves (V, VII, VIII, IX, X, XI and XI) as well as their different exits through the brainstem.[1] The tumor pathology of this compartment is very common during childhood, in fact, infratentorial tumors account for 48% of brain tumors in children. In adults, however, brain tumors are more common in the supratentorial compartment, with those in the posterior fossa accounting for only 20-30% of all CNS tumors. In general, they are typical childhood tumors, being rare in adults, where they comprise only 2-5% of all brain tumors. In children they are typically located in the posterior fossa and in adults (3rd decade of life) they are more frequent in the supratentorial compartment. However, given their similar appearance with other tumors of the posterior fossa, we must always take this into account. When located in the posterior fossa, 80% originate from the floor of the IV, 8% from the roof, and 5% from the lateral recesses, with a marginal percentage of cases that only affect the cerebellar hemispheres without connection to the IV ventricle. Once they completely fill the ventricle, they tend to cross the foramina of Luschka and Magendie, thus extending towards the APC cistern or the cisterna magna.[2] The word supratentorial or infratentorial describe the location. Supratentorial tumors affect the lateral and third ventricles, infratentorial ependymomas occur below the tentorium, called the posterior fossa, including the fourth ventricle, brainstem, and cerebellum. 2-3% are rare tumors, in adults 60% are in the spinal cord and in children 90% in the posterior fossa. Common symptoms are irritability, drowsiness, vomiting, nausea, headache; associated with hydrocephalus, the diagnosis is with MRI or tomography.[3]

Clinic history

A 44-year-old female patient, who was admitted to the IMSS-3 Hospital on March 10, due to headache and vomiting, self-medicated (with diclofenac), without diminishing symptoms, for which she went to a private doctor in Pabellón de Arteaga (22-02-2022), who decides to perform a CT scan, hydrocephalus and a tumor in the posterior fossa of origin to be determined are identified, so she is taken and admitted to the IMSS emergency room, evaluated by neurosurgery, which is decided to proceed to ventriculostomy in the first instance to resolve the urgency (03-18-2022). He was re-admitted to the surgery floor and the resection of the posterior fossa tumor was scheduled again in the second stage. Important history: the patient suffers from type 2 diabetes mellitus (type 2 DM) under treatment with metformin ½ tab every 12 hours since Nov 2021, hypertriglyceridemia under treatment. Surgical hysterectomy 5 years ago without complications, denies allergies. The patient is referred with a Glasgow score of 15, she only reports nausea and vomiting, she is scheduled for resection on March 28. The intervention lasted ten hours and was uneventful, except for extreme bradycardia with manipulation of the floor of the IV ventricle that responded to 1 mg of intravenous atropine with sinus rhythm after 80 beats per minute. From the neurophysiological point of view, no significant alterations were observed. It was decided to postpone extubation and the patient was transferred to intensive care for surgical hours (10 hours) and 90% resection with cerebral edema. Orointubated patient, hyporeflective pupils: 2/2 mm, under sedation with a Richmond scale (RASS) of -5, mechanical ventilation, without aggregates, chest X-ray without consolidations or aggregates. Without the use of amines, normotensive (BP 110/59 mmHg), heart rate (HR) 88 beats per min, sinus rhythm. Diuresis present 1.1 ml/kg/hr, other organs and systems without data to mention. Patient who stays 72 hours post-surgery with sedoanalgesia, a neurological window begins until the 3rd day, passing from deep sedation to Dexmedetomidine (Precedex) to wake her up. On 03/31/2022, she woke up, unable to swallow, and without a cough reflex, so she cannot be extubated. Neurologically, she responds to verbal stimuli and obeys simple commands. Therefore,

she gives herself time to recover missing reflexes (7 more days). She did not recover, a protocol for early tracheostomy was started, a rapid test and PCR for COVID (04/04/2022) were performed, coming out positive, being transferred on 04-07-2022 to a hospital specialized in COVID (IMSS-1). The patient died in another hospital due to COVID complications (04/18/2022).

Laboratories Table 1

	10/03/2022	22/03/2022	25/03/2022	28/03/2022
Hemoglobin	13.4	12.1	12.3	11.4
Hematocrit	38	35.1	36.5	31.4
Platelets	307 mil	327 mil	240 mil	310 mil
Leukocytes	9.9	6.67	11.09	10.4
Lymphocytes	4.65	4,47	8.17	0.45
Neutrophils	4.82	2.01	2.28	9.9
Creatinine	0.9	0.9	0.6	1.7
BUN	19.9			
Glucose	105	119	97	152
Na	141		140	145
K	4.5		3.4	4.2
Cl	105.4		105	113.2
Ca	9.1		9.2	7.4
TP				11
INR				1.07
DHL				355
AST				38
ALT				33
pH				7.4
$PC0_2$				29
$Pa0_2$				163
$HC0_3$				19
DB				-6.9
$Sat0_2$				98%

Cabinet studies

• Simple contrast-enhanced MRI of the skull March 17, 2022: Tumor of the posterior fossa located adjacent to the posterior face of the brain stem and extending caudally through the foramen magnum is hypodense on T1 and hyperintense on T2 in a heterogeneous manner on pulse sequences T1 with gadolinium shows heterogeneous enhancement, measuring 67x25x29mm. • Simple skull CT scan: March 22, 2022: tumor at the level of the IV ventricle, probable ependymoma, ventriculostomy valve. Posterior fossa elements of adequate volume and density. A space-occupying process of heterogeneous density, mixed, with solid, cystic areas and calcifications, located in the IV ventricle, measures 27 x 20mm, is identified. ● Chest x-ray: 03/11/22. Shortened, slightly rotated, preserved lung volume, without presence of consolidation or effusion. • Electrocardiogram: 03/14: at 25/10 mm/mv, with 86 bpm, sinus rhythm, T-wave inversion in AVR, v1, v2. No presence of ischemia or necrosis lesion.

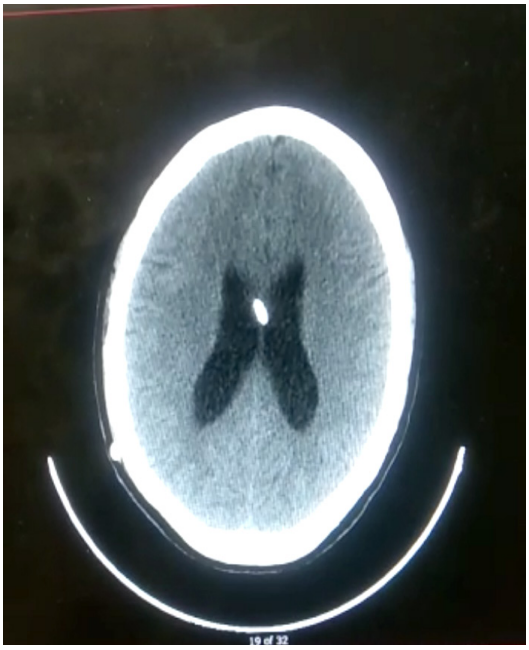

Figure 1 Brain image showing hydrocephalus, after placement of the ventriculoperitoneal catheter.

Figure 2 Sagittal image of the brain to show surgery and edema, taken on March 30.

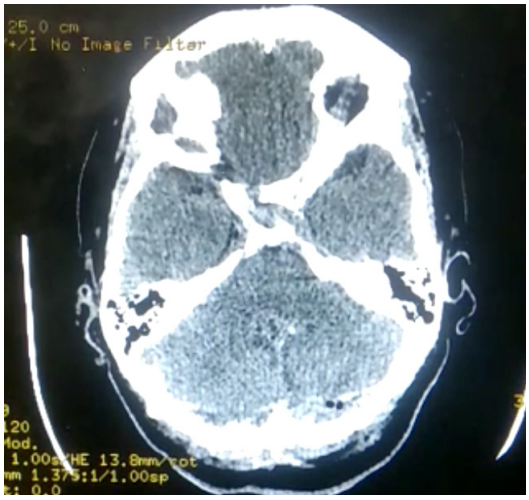

Figure 3 Cross-section of the brain showing the March 30 edema.

Discussion

Patients who failed extubation were compared with those who were successfully extubated for length of ICU stay, length of hospital

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stay, tracheotomy, ICU mortality, hospital mortality, pulmonary complications and functional outcome, in this study we talk about 43 patients, re-intubation was respiratory failure in 41.6%, they had extubation failure within 24-35 h after extubation; and 8 (18.6%) had failed extubation within 36-48 h after extubation, as in the case described above, which cannot be extubated due to damage or injury to cranial nerves V, IX and XII.[4] Another study reveals that neurosurgical patients are at risk of neurological complications, mainly in the immediate postoperative period. The presence in the postoperative period of new neurological deficits may be indicative of cerebral edema or hemorrhage. Hecht et al.[5], describe as safe the transfer of patients to a conventional room after scheduled craniotomies without complications, after adequate blood pressure control and the start of an effective analgesic regimen in the first four postoperative hours in the Care Unit. Post-surgical Intermediate (UCIP). They defend that blood pressure control should not necessarily be invasive and depend on a PCCU. However, their model involves a neurological examination every two hours and basic monitoring in the neurosurgical room, with alert scales for early detection of complications in the immediate postoperative period (<72 hours). In this sense, the importance of close clinical surveillance in the immediate postoperative period must be highlighted, regardless of the patient's postoperative destination. Herrero et al observed that 23% of the patients developed neurological complications in the post-surgical intermediate care unit (PICU), defined as any neurological alteration documented in the patient's clinical history during their stay in the PICU, in the neurosurgery room or any finding in neuroimaging studies considered as a complication according to the neurosurgeon's criteria. The joint application of the scales and the unilateral BIS registered more alterations than the GCS-pupil examination, were more sensitive and allowed a more precise estimation of the appearance of neurological complications in the PICU. Baseline unilateral BIS values were different between patients who developed neurological complications or not, associated with alterations in neuroimaging tests (baseline BIS 84 and 94, respectively); which could show a potential predictive value of baseline BIS for the appearance of postoperative neurological complications.[6]

Conclusion

The patient presented in the clinical case was scheduled for scheduled surgery, which lasted more than 8 hours of surgery, they reported cerebral edema at the end of surgery. In the intraoperative period, there was no neurosurgical monitoring, such as evoked potentials or some other device to assess damage to the cranial nerves, as well as BIS or EEG. Already being in intensive care after 11 days of stay, only the first 3 days was monitored with EEG, and his CAT 48 hours later, to assess awakening, detecting a good neurological state, responding to simple commands, mobilizing all extremities, normal eye opening, but without swallowing and cough present, so extubation was not possible. In the previously exposed literature, there are extubation scales and criteria, as well as guides with measurements to be able to carry out extubation based on predictors, which should be protocolized in intensive care units, as well as in the operating room, to reduce extubations failed.

Acknowledgments

None.

Conflicts of Interest

None.

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