Arachnoid interamigdal cyst of the posterior fossa in an adult female

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Abstract

Introduction: Arachnoid cysts are benign extracerebral collections of cerebrospinal fluid; a very low incidence has been described as part of all intracranial lesions (about 1%). They appear in the different anatomical areas of the neuroaxis where arachnoids exist; the majority are supratentorial and in the middle fossa (50-60%). In general, less than 50% of cases present manifestations that merit surgical treatment. **Case report:** A 55-year-old female underwent surgery due to torpid evolution as a result of an arachnoid cyst in the posterior fossa. She started suffering from episodes of pulsatile headache 2 years ago without irradiation accompanied by occasional vertigo that was attenuated with conventional analgesia. In the past week, the pain was exacerbated, as was the vertigo, intolerance to the oral route, and generalized weakness. A scheduled surgical intervention was decided on, and a histopathological study reported characteristics compatible with an arachnoid cyst. **Discussion:** Arachnoid cysts are an uncommon pathology that sometimes requires surgical intervention. In the case presented, the incipient clinic manifestations showed that the patient had an abrupt progression in her intensity, perhaps due to an increase in size, conditioning the increasing headache, and added symptoms. This culminated in her assessment and surgical intervention due to the important compression of the brain stem. It was considered a successful procedure due to the disappearance of the symptoms and the return to her activities. **Conclusions:** Surgical intervention for posterior fossa arachnoid cyst is an excellent treatment when the symptoms do not improve after having maintained an expectant conduct through conservative management.

Key words: Arachnoid cyst. Arachnoid. Dandy-Walker. Posterior fossa.

Introduction

Arachnoid cysts are benign extracerebral collections of cerebrospinal fluid (CSF) originating from the division of arachnoid membranes *in utero* (primary cysts); however, there are secondary cysts which often appear after trauma, surgery, or intracranial infection¹⁻³.

Conventionally, a low incidence has been described as part of all intracranial lesions (about 1%), they are most

common among men with a 2:1 ratio. They are observed with a higher frequency in the left hemisphere. They are mostly detected in the first two decades of life and are less frequently diagnosed in adults and among the elderly¹⁻⁵. They appear in the different anatomical areas of the neuroaxis where arachnoids exist; most of them are supratentorial and are located in the middle fossa (50-60%), the rest can appear in the cerebellopontine angle, suprasellar

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Figure 1. **A:** axial fluid-attenuated inversion recovery-weighted cut where we can see an arachnoid cyst located in the cerebellous vermis with signal intensity similar to CRF. **B:** axial T2-weighted cut, where an ovoid mass is observed compatible with an arachnoid cyst. **C:** coronal cut on T2 with the same findings. **D:** sagittal T1-weighted cut, where we can observe a cystic image that compresses adjacent tissue.

and quadrigeminal cisterns, cerebral convexities, and the cisterna magna¹⁻³.

Due to its diversity, clinical manifestations tend to depend on their age, location, and size; the most common signs are those derived from the mass effect provided by the cyst or disorders in CSF circulation. In general, less than 50% of cases present manifestations which justify surgical treatment³⁻⁵.

Here, we will present the case of a female with arachnoid cysts in the posterior fossa; to date, there are few reported cases with the same location.

Clinical case

A 55-year-old female underwent surgery due to torpid evolution as a result of an arachnoid cyst in the posterior fossa (Fig. 1) who started with episodes of pulsatile headaches 2 years ago without irradiation, accompanied by occasional vertigo that was attenuated with conventional analgesia. In the past week, the pain was exacerbated, as well as the vertigo, oral route intolerance, and generalized weakness. A scheduled surgical intervention was decided.

During physical examination, the patient scored 15 points on the Glasgow scale, with superior mental functions retained, normal strength on all four extremities. She also retained sensitivity, global ++ reflexes without pathological reflexes, indifferent bilateral plantar response without data of meningeal irritation, and retained gait. The surgical intervention was programmed for August of 2019.

Surgical technique

Under general anesthesia, the patient was infiltrated with ropivacaine for cephalic regional anesthesia, in ventral decubitus, with the head in a neutral position fixed to the Mayfield head holder. A mid-sagittal split was performed on the nape region under the external occipital protuberance of approximately 10 cm, and the upper and lower occipital line muscles were deinserted, showing the external occipital crest, as well as the posterior margin of the foramen magnum. A suboccipital craniectomy and laminectomy of C1 were performed using a craniotome (Midas Rex) using an auto-stop drill bit, cutting drill bit, and an acorn drill bit and gouges. As well as ligament dissection with Penfield #2, the dura mater was identified, and a “Y”-shaped incision was made, observing a subjacent arachnoid cyst between cerebellous amygdalae facing the foramen of the Magendie, which was identified under an Pentero microscope (OPMI). The cyst was punctured, obtaining 5 ml of rock water. The cyst walls free of nervous tissue were excised, and no aggregated lesions were identified (Fig. 2). Both posteroinferior cerebellous arteries were visualized in their cortical and telovelotonsillar segments. The dura mater was closed with dural substitute and fibrin sealer, closing each layer (Fig. 3).

The histopathological study reported a piece referred to as a cerebellous cyst of three irregular light brown soft fragments, with a long axis between 1 and 1.5 cm; characteristics after staining were compatible with those of an arachnoid cyst (Fig. 4). The post-operative stage unfolded without incident. A computerized tomography conducted a month after surgery revealed that the cysts had collapsed, and remains of it were found. At the last follow-up performed in November of 2019, the patient reported an absence of headaches, vertigo, or weakness, scored 15 points on the Glasgow scale, with preserved superior mental functions and cranial nerves, symmetrical and normoreflexive 2 mm pupils, conjugate gaze, facial symmetry, adequate hearing, normal strength, preserved sensitivity, global muscular stretching reflexes ++, without cerebellous

Figure 2. Transoperative. **A:** ventral decubitus of the patient fixed with the Mayfield head holder and the incision to perform. **B:** surgical approach with suboccipital region exposure, a separation of muscle plane with tweezers is observed, dura mater elevation in cardinal points, cottonoids were placed (blue) to keep the surgical field clean. **C:** surgical approach, with cerebellar tonsils at the bottom and the presence of mid-line postero-inferior cerebellous arteries. **D:** a closer look at the surgical field, where we are able to see the multiple vessels in the cerebellous cortex.

Figure 3. **A:** computed tomography (CT) axial cut in simple phase at posterior fossa level, where we are able to observe a small residual cyst linked to “air bubbles” and a lack of occipital bone tissue as a result of post-surgical changes. **B:** CT sagittal cut at mid-line level with window for soft tissues. **C:** CT axial cut in simple phase at posterior fossa level, where we are able to observe a small residual cyst with the presence of a post-surgical clip. **D:** residual cyst linked to “air bubbles.”

nor meningeal data, and the surgical wound in the posterior cervical region with proper healing (Fig. 5).

Discussion

Posterior fossa lesions, according to the classification by Barkovich et al.⁶, can comprise arachnoid cysts of the posterior fossa (posterior fossa arachnoid cyst [PFAC]), the mega cisterna magna, and Dandy-Walker malformations, to name a few⁷. The posterior fossa is the second most common place (1 in 3 cases) where arachnoid cysts are located. They are frequently inside the cerebellous convexity in an inferior or posterior position to the vermis in a mid-sagittal direction (retrocerebellous), cranial to vermis in the tentorial hiatus (supravermian), anterior or lateral to cerebellous hemispheres, or anterior to the brainstem. Arai and Sato⁸ classified arachnoid cysts in a mid-line or hemispheric retrocerebellar and pontocerebellous angle. The PFAC located in the mid-line must be differentiated by the Dandy-Walker and mega cisterna magna malformations, where no compressive phenomena are evidenced; in this case, given the characteristics presented in the imaging studies, it was possible to have PFAC suspicions from the beginning.

We ought to highlight that the characteristics of arachnoid cysts usually vary widely according to the age of the patient. Hence as informed, cysts in infants can occasionally become enlarged (16.2%). Nevertheless, this feature does not occur in adults⁹. This increase in size is usually secondary to pressure gradient and oscillatory changes with the same diastolic pressure. Other theories mention the fact that the expansion of the cyst may be linked to the direct liquid secretion of the cyst lining by the arachnoid cells that form the wall or by ectopic structures similar to choroids⁹⁻¹¹. Similarly, obstructive hydrocephalus has been described as a common presentation.

In our case, the developing clinic data presented by the patient displayed an abrupt progression in intensity. This, perhaps as a result of size, conditioning the increasing headaches and aggregated symptoms similar to those of endocranial hypertension syndrome, yet without the severity comparable to said entity. However, this has been an assumption by the authors since there is no evidence provided by previous imaging studies that may contribute information regarding cyst increase culminating in its assessment and surgical intervention.

Whereas most arachnoid cysts are asymptomatic, the distinctive signature of PFAC is variability in the presentation of signs and symptoms, which depend on the specific location and may cause vague and non-specific symptoms that range from headache and dizziness to manifestations such as psychomotor failure (retardation), seizures, or even manifestations similar to those of multiple sclerosis^{12,13}. In the case described herein, even though there were no severe changes in personality, the increasing headaches and their sustained permanency resulted in the concurrency of the patient to consultation for its management.

Jian-Huang et al.¹⁴ reported 488 cases in pediatric patients, describing 82 PFAC carriers, with the cerebellum veriform process the most common location in the same posterior fossa (60 cases). It is worth mentioning that Jian-Huang et al.¹⁴ himself described three locations inherent to the posterior fossa without mentioning the subjacent region to the amygdalae, perhaps being the first described case not corresponding to a Blake pouch cyst. Furthermore, in our case, there was a communication of the cyst with the Magendie foramen, possibly causing a cleft valve effect resulting in symptoms similar to those of endocranial hypertension syndrome, which has been observed in different studies during endoscopic procedures for the resolution of these cysts¹⁵. On the other hand, the affection of the Magendie foramen has been described in a few cases, being observed commonly in pediatric patients. Hence, PascualCastroviejo et al.¹⁶ informed of three cases of PFAC in the Magendie foramen within their revision of 67 cases of children; however, the radiological clinical characteristics of these cases were not discussed; similarly, De Oliveira Filho et al.¹⁷ and Hayashi et al.¹⁸ mentioned two isolated cases concerning PFAC with Magendie foramen involvement with similar symptoms to those described in chronic subdural hematomas.

Magnetic resonance imaging (MRI) continues to be the diagnostic method of choice since it allows us to differentiate between the different lesions based on the intensity of the signal, which is abnormally high in fluid-attenuated inversion recovery image sequencing, and divided by diffusion. Our case was not an exception; while the follow-up projections after surgery came from a teller acuity cards, the imaging study utilized at the beginning was the MRI². While the treatment of choice for the majority of cases is conservative, in difficult cases with progressive neurological deficit or persistence of symptoms, surgical procedure is the treatment of choice¹⁸. In this case, after having maintained an expectant and conservative conduct, there was a

Figure 4. Tomographic images corresponding to the latest follow-up. **A:** axial. **B:** sagittal. **C:** coronal plane.

Figure 5. Hematoxylin and eosin staining showing the walls of the arachnoid cyst with meningotheelial cells.

need to drain the cyst due to presented clinical manifestations, which lasted for a prolonged time, as well as a significant projection of the brain stem.

The neurosurgical approach for intracranial arachnoid cysts remains controversial; as a result, proposed therapeutic alternatives include stereotactic aspiration, a cystoperitoneal shunt, marsupialization, and endoscopic cyst fenestration or craniotomy, to collapse the cyst for the clinical improvement of the patient^{1-5,15,19-21}.

Most patients show positive clinical results after surgical intervention; that is, they present a partial or full resolution of symptoms after medical discharge and follow-up^{19,22}. In addition, a decrease in the size of the cyst was observed in most patients through control imaging studies²², as it occurred in our case. On the other hand, a relatively high latent risk of post-operative complications has been described (10-15%)²², which include a wide range of possibilities such as a cerebral spinal fluid (CSF) leak and subdural recollection of liquid and meningitis after surgery, with the persistence of headaches being the most common after intervention²². We ought to highlight that in this case up until

this moment, no complications inherent to the surgical procedure have been presented. Furthermore, the patient refers to an evident improvement with a complete disappearance of the symptoms for which they attended the medical appointment in the first place.

Surgical intervention for PFAC is an excellent treatment when the symptoms do not improve after having maintained an expectant conduct through conservative management.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

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