Clinical case

Carotid apex aneurysms in children. Case report

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ABSTRACT

Background. Aneurysm malformations of the circle of Willis comprise a rare group of congenital anomalies that occur during the pediatric age and are a major cause of morbidity and mortality in this age group. Consequently, management of these lesions is complex and potentially lethal and may pose problems for the patient and affect their treatment.

Case report. We report the case of a 10-year-old girl who had a sudden onset of neurogenic syncope and tonic-clonic seizures. After arriving at the emergency room she underwent a CT scan, identifying a Fisher II subarachnoid hemorrhage. Four-vessel cerebral angiography identified apex saccular carotid injury ~5.1 x 7.2 mm with visible neck and dome partially cephalic and partially frontal. Right frontopterional craniotomy was performed and preclipping during transsurgical ultrasound was performed, identifying the aneurysmal lesion and postclipping to verify patency of the distal branches to clipping.

Conclusions. Aneurysmal malformations in children are extremely rare. For this reason, methods such as endoscopy and trans- and postoperative ultrasound are very useful. These procedures sometimes reveal details that conventional imaging studies do not, determining use of a procedure with less risk of morbidity and mortality for these patients.

Key words: cerebral aneurysm, aneurysmal rupture, subarachnoid hemorrhage, pediatric.

INTRODUCTION

Aneurysmal malformations of the circle of Willis comprise a rare group of congenital anomalies when they occur in the pediatric age and are a major cause of morbidity and mortality in this age group. Aneurysms in children are rare, with an incidence from 0.5 to 4.6%.[1,2]

It is believed that aneurysms in adults are formed by multiple factors (family history, age >50 years, use of cocaine, hypertension, among others). In childhood, most of these factors do not exist. For this reason, the pathophysiology is different.[3,4] Some researchers propose that a vascular disease predisposes vascular regions of the brain for the formation of aneurysms.[5,6] The most frequent locations in this age group are the carotid bifurcation, posterior circulation, anterior circulation and distal branches of the midbrain.[7]

With respect to morphology, few reports have claimed that saccular aneurysms in children are different from adults. On this basis the etiology and morphological characteristic can be defined according to four groups: traumatic, infectious, dissecting and saccular. In the majority of pediatric patients with aneurysm rupture, the clinical picture is similar to adult patients: subarachnoid hemorrhage: headache, vomiting, changes in the state of consciousness, seizures, and focal neurological defcits.[8-10]

The diagnosis of pediatric patients with ruptured cerebral aneurysm carries a great challenge. Today, with advances in imaging studies, all pediatric patients with clinical data of subarachnoid hemorrhage should undergo a plain computed tomography (CT) of the head to confirm the presence of a bleed. If the study is negative but with a high clinical suspicion, a lumbar puncture will be neces-

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sary. It will also be necessary to carry out cerebral panangiography to verify the diagnosis.[11]

Treatment of aneurysms in the pediatric population requires a multidisciplinary management that includes a neurosurgeon or pediatric neurosurgeon, pediatric neurologist, pediatric intensivist and interventional radiologist. It is very important to mention that management of this disease in this age group is more successful. Some possible reasons are that these patients can better tolerate a subarachnoid hemorrhage and the efficiency of the leptomeningeal circulation.[12] Treatment options are neurosurgical, endovascular or conservative management.[13]

We present an unusual case of a carotid apex aneurysm in a 10-year-old patient where the usefulness of endoscopy and intraoperative ultrasound before and after the clipping is demonstrated.

CLINICAL CASE

We present the case of a 10-year-old female who was admitted to the emergency room due to sudden, sharp headache affecting the entire head. Subsequent to this, she had neurogenic syncope and generalized tonic-clonic seizures. On admission she had a Glasgow score of 14 (disorientation), and fundoscopy demonstrated bilateral papilledema. CT scan of the head showed hyperdense image suggestive of bleeding located in right Sylvian cistern compatible with a Fisher II subarachnoid hemorrhage (Figure 1). Cerebral panangiography showed a saccular type vascular lesion (5.1 mm x 7.9 mm) on the right carotid apex with a visible neck and dome in a cephalad direction and towards the frontal lobe (Figure 2). Management to prevent vasospasm was initiated in the pediatric intensive care. On day 10 after the seizure, a surgical procedure with a right frontoparietal craniotomy and subfrontal approach was performed. Prior to the opening of the dura mater, an ultrasound was performed using an ultrasound probe of 10 mHz (Figure 3). The dome of the aneurysm was located and its orientation was confirmed in a cephalic-frontal direction observed in the angiographic study and a small inclination towards the anterior cerebral artery, a detail not identified in the angiographic study already mentioned (Figure 4).

Microsurgical dissection was performed starting with the identification of the right carotid cistern and continuing with the arachnoid opening contralaterally up to the left optical cistern. There was adequate visualization of the right carotid artery and ipsilateral Sylvian cistern in its proximal third. An opening was created in the lamina terminalis (as is usually done in adult patients) with the purpose of obtaining a direct intraventricular communication that decreases the risk of hydrocephalus. Dissection proceeded all the way from the right carotid artery to the bifurcation.

The first portions of the anterior and middle cerebral artery were discovered. Next, dissection of the aneurysmal area was carried out and endoscopic confirmation was done both of the neck as well as of the arterial branches (Figure 5). We used a straight 9.1 mm Yasargil clip. A complete occlusion of the neck confirmed by endoscopic and microscopic control was achieved (Figure 6).

Closing was begun once the permeability of the vascular branches was verified. The patient was then transferred to the pediatric intensive care unit the unit and weaned from anesthesia. Extubation was done on the following day. The patient was then admitted to the pediatric department 48 h after the surgical procedure. A decrease in visual acuity in the right eye was then detected, which did not show improvement. The possible associated cause remained unknown despite review of a video recording

Figure 1. Simple brain tomography where bleeding is evidence in the right Sylvian cistern. Data of Fisher II subarachnoid hemorrage.

of the procedure. The patient was discharged in improved condition on the tenth postoperative day.

DISCUSSION

These types of vascular malformations are unusual in the pediatric population and require all available additional information before and during the clipping procedure. Use of ultrasonography during microsurgical dissection provided information confirming the characteristics of the dome not seen in the panangiography and these characteristics were correlated intraoperatively in three-dimensional real time and with the head of the patient positioned and fixed during the surgical procedure. This allowed greater safety and speed to reach the exact location of the dome of the aneurysm.[14] In this case it also provided an extra anatomic detail: the slight inclination of the aneurysmal dome toward the anterior cerebral artery (an important de-

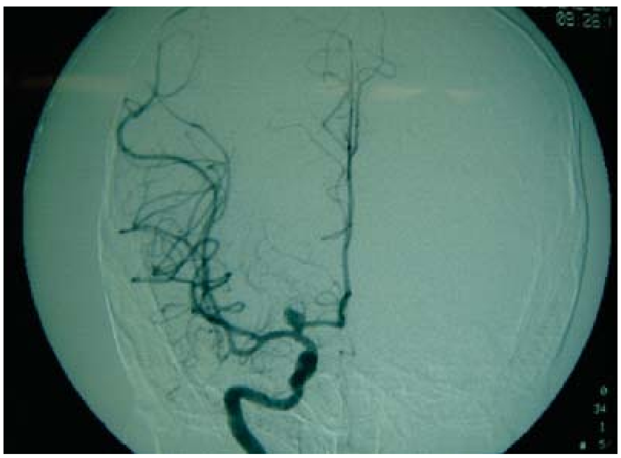

Figure 2. Cerebral panangiography in arterial phase that presents aneurysm in the right carotid apex with a visible neck and dome in a cephalad direction and towards the frontal lobe.

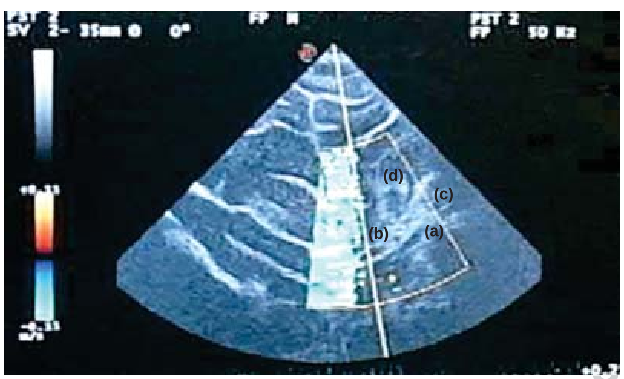

Figure 3. Interoperative neurosonography prior to dural opening showing the carotid artery (b) and the site of origin of the aneurysm in the bifurcation of the middle cerebral artery (a) and the anterior cerebral artery (c). Detail showing orientation of the dome of the aneurysm in the anterior cerebral artery, as well as the presence of the clot into the dome at the point where the rupture probably occurred (d).

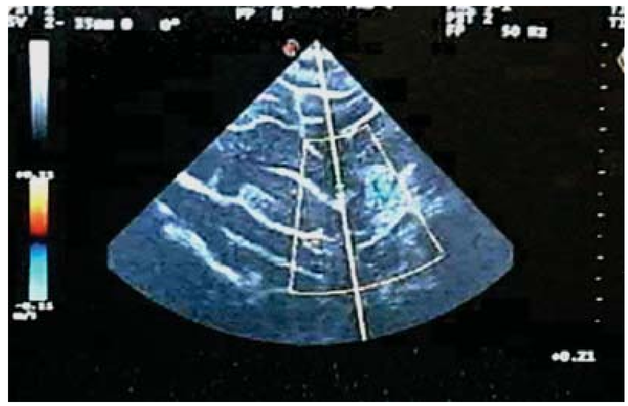

Figure 4. Ultrasound image showing (in blue) the pressure of the blood stream on the walls of the aneurysm, in addition to the anatomic details already described in the previous image.

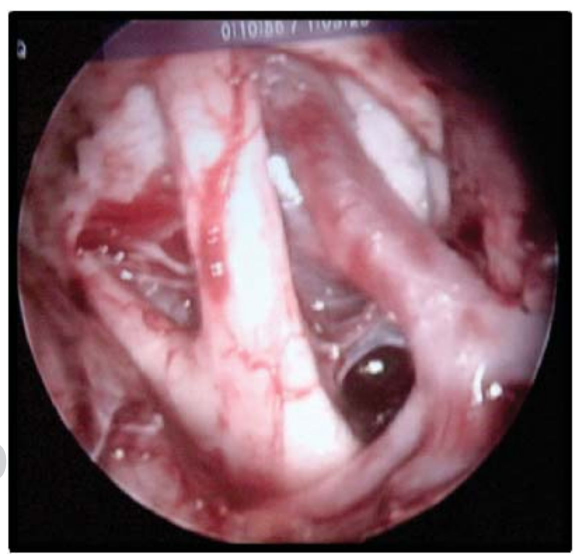

Figure 5. Neuroendoscopy showing microscopic dissection with arachnoid opening contralaterally until reaching the left optic cistern, right carotid artery and proximal third of the ipsilateral Sylvian cistern.

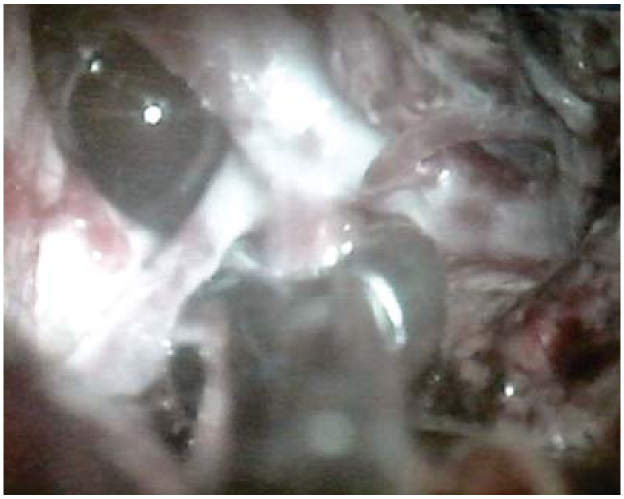

Figure 6. Microscopic image showing saccular lesion in the carotid apex with prior occlusion of aneurysm.

tail that was considered at the time of the placement of the clip). The endoscopy, where the dome of the aneurysm had a superior direction, showed the same relevance as the cases of aneurysm in the adult population, which originate near smaller branches and with an inferior direction toward deep structures. The complication in the visual acuity of the right eye did not show a direct surgical cause of dissection of the optic nerve and the visual pathway despite a video analysis of the procedure. In institutions with an endovascular therapy service, evaluation must be made regarding the usefulness of carrying out a procedure under these techniques based on the joint discussion of the neurosurgical group.

The presentation of aneurysm in the carotid bulb in this patient is rare. The use of endoscopy, already known in the adult population before and after clipping of the aneurysm to give greater safety to the procedure, reported the same beneficial usefulness in the case presented. Intraoperative use of ultrasonography provides a useful tool for further on-site, real-time information, which enhances the security of the clipping, therefore reducing the risk of complications.

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