José Hugo Arredondo-Estrada*
Fernando Vélez
Felipe Carrillo*
José de Jesús de la Torre*

Cavernous angioma. Findings on a group of patients of the "Rio Sonora" region on the state of Sonora

ABSTRACT

A retrospective longitudinal analysis was performed on patients with MRI diagnosis of cavernous angiomas between January of 2002 and April of 2011. At Diagnóstico por imagen radiology center in Hermosillo, Sonora.

Subjects and method. 25 studies were performed using standard sequences. lesions were recorded. Studies were reviewed by a general diagnostic radiologist and a neuroradiologist.

Results. Most of the lesions are suptra tentorial in location. Ten patients had solitary lesions. While the rest had more than two lesions.

Discussion. The imaging findings are similar to what is described in the literature. Most of the lesions are supra tentorial. Although the better part of our patients had more than one lesion. All of our patients came from a specific geographical area of Sonora ("rio Sonora" region) which should be genetically studied for further understanding of this pathology.

Key words. Cavernous Angioma, Magnetic resonance imaging, headache, seizures.

*Diagnóstico por Imagen de Hermosillo. Gastón Madrid No. 24, Col. Centro, 83000, Hermosillo, Sonora.
Copias (**copies**): José Hugo Arredondo-Estrada. E-mail: jharredon960@yahoo.com

Introduction

Cavernous angioma, also known as cavernous hemangioma or cavernoma, was described by Luschka in 1853 as an incidental finding in a suicidal patient.[1] Cavernous angiomas account for 5% to 13% of cerebral vascular malformations and are thought to be present at birth.[2] Multiple lesions are not uncommon. Cavernous angioma is a developmental vascular malformation that is typically a discrete multilobulated, berrylike lesion containing hemorrhage in various stages of evolution. Hemorrhage is a common complication of a cavernous angioma and is the cause of the first presentation in 30% of cases.[3,4] The reported annual risk of hemorrhage in a cavernous angioma varies widely (1–6.8%).[5-7]

MRI is the most useful technique employed in the diagnosis and evaluation of cavernous angiomas. Cavernous angiomas are mixed signal lesions with a pop corn appearance and a T2 blooming sing due to low signal intensity hemosiderin rim that surrounds the lesion. T2 weighted images are especially sensitive to detect and diagnose cavernous angiomas. This typical appearance has been reported in 50 to 67% of the patients[8,9] with cavernous angiomas.

Subjects and method

The study was a retrospective longitudinal analysis of brain magnetic resonance studies performed on a group of patients referred to our institution. A 1.0 Tesla MRI system GE medical system, was employed with conventional T1 and T2 spin echo and gradient echo sequences performed, in the sagital, axial and coronal views. T1 images with TR 1967 and TE of 8.5, t 2 with TR of 3116 and Te 112 and GE with TR of 9002 and TE of 152. All patients were referred from outpatient clinics from the different state institution hospitals in the area. Referred with one of the following diagnosis; headache, neurologic disorder or seizures. The studies were read by a general diagnostic radiologist and a neuroradiologist. 25 patients; 13 female and 12 male patients. Age range 11 months to 54 years.

Results

Twentyfive patients were studied 13 female and 12 male. Age range between 11 months and 54 years. All were referred to our institution for MRI with the following diagnosis; headache 7, vascular ictus 3, sei-

zures 7, neurological deficit 8. Ten patients had solitary lesions, four had two lesions, 8 had three lesions and three patients had more than five lesions. A total of 39 lesions were present. (Table I). Their localization was, supratentorial 27 (69.25%), brain stem 8 (20.5%) and infratentorial 4 (10.25%). Patients with multiple lesions are in another group thou to the extensive number of cavernous angiomas. (Images 1a, 1b, 1c and 1d).

Also three patients had hematomas at the site of the cavernous angioma with edema and one of the multiple angiomas patients had cerebral atrophy.

Discussion

Cavernous malformations (cavernous angiomas are a form of vascular malformation more frequently detected on magnetic imaging studies) it can be seen as single solitary or multiple lesions, it can also be associated with a familial forma of the disease or present itself with no positive history of familial trait.[10-11]

Histologically, cavernous malformations consist of irregular, sinusoidal, vascular spaces well demarcated from surrounding normal tissue. the thin walled, endothelium-lined channels lack elastic and muscularis, lie adjacent to one another without intervening neural tissue, and are usually unaccompanied by large feeding arteries. Enlarged draining veins may or may not be encountered. Vessel walls frequently are hyalinized, and hemosiderin staining and gliosis of adjacent tissue reflects previous minor hemorrhages malformations. these lesions may vary in size from 1 mm to several centimeters in diameter and may be associated with telangiectasias and cavernous angiomas in the skin, liver, and kidneys.

Table I. Cavernous angiomas. Topographic localization of lesions

Localization	Number of lesions
Frontal	05
Parietal	15
Temporal	05
Occipital	02
Brain stem	08
Cerebellum	04
Total	39

The natural history of cavernous angiomas is still not known. With the use of magnetic resonance studies a good number of cavernous angiomas are discovered as incidental findings for unrelated symptoms. When symptoms are present they can be associated with headache, neurological deficit or seizures. Angiographic and CT studies are not as sensitive to this type of vascular malformations. To have a negative ct does not rule out the diagnosis of cavernous angioma.

They are heterogeneous lesions with a reticular pattern and hemorrhage at different stages of evolution. They give mixed signal intensities giving a popcorn-like appearance and have a long signal rim that represents hemosiderin deposits of previous bleeding. (Images 2 and 3).

A mayor incidence of supratentorial location has been reported, which correlates well with our findings.[12-14] Our results in agreement with the literature show more sensitivity of gradient echo images to spin echo sequences. This is secondary to the blood stagnation phenomenon or to chronic microhemorrhages, cavernous angiomas contain deoxyhemoglobin or hemosiderin, which generates susceptibility effects and cause a decrease in signal intensity. Currently magnetic resonance is the best imaging modality to diagnose these lesions.

The differential diagnosis of small hemosiderin deposits can include prior contusion areas, hemorrhagic infraction or tumor related hemorrhage. Clinical history can clarify the difererential diagnosis in most cases. There is a special type of presentation seen on this patients; type 4 which is described as not visible on T1 or T2, only seen on gradient eco sequences.[15] This type of lesions can be isolated or be present in a familiar trait. Hispanic Americans have been recognized

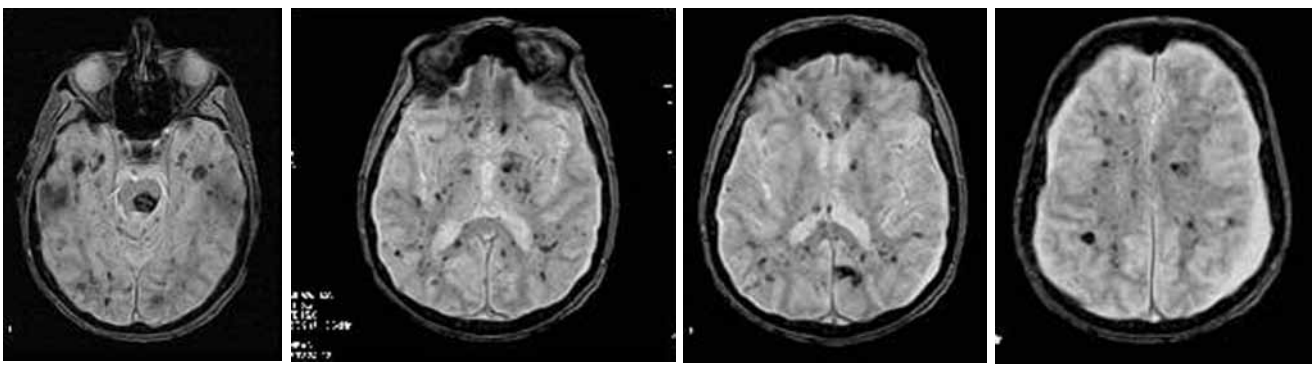

Image 1. 5 year old patient referred with neurological deficit disorder. Eco gradient MR with multiple type 4 cavernous angioma lesions seen throughout the brain parenchyma.

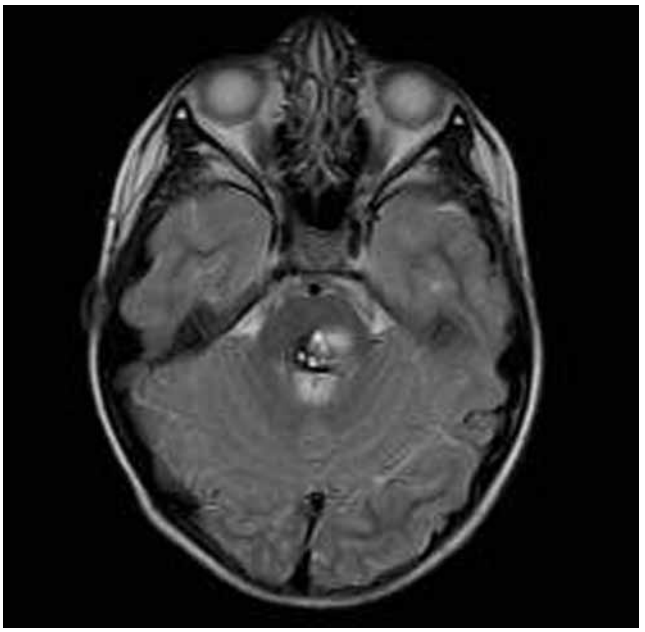

Image 2. T2 weighted image with pontine cavernous angioma and reticular pattern a mixed signal intensity with a hemosiderin rim.

as been susceptible to this disease.[16-19] We had no family relationship between the patients in this series.

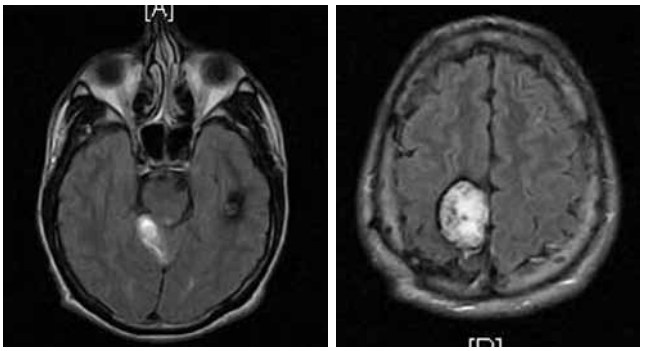

Image 3. 23 year old female patient with hemorrhage at dorsal cerebellum and dorsal right parietal lobe from cavernous angiomas. The patient also presents a left mesenchepalus and left parietal angiomas with hemosiderin deposits.

Although we have to acknowledge that they come from the same geographic region of the state of Sonora, the Rio Sonora area. The inheritance pattern in this disease is an autosomal dominant trait with variable penetrance and expression. A single mutation on the Kri 1 gene is found on approximately 70% of hispanic patients with this disease in the United States. Further genetic studies should be performed to integrate the information on this pathology relative to the “rio Sonora” area.

Referencias

1. Luschka h. Caverno¨se Blutgeschwuelste des Gehirns. Arch Path Anat 1853;6:458.
2. Rapacki TFX, Brantley MJ, Furlow TW, Geyer CA, Toro VE, George ED. Heterogeneity of cerebral cavernous hemangiomas diagnosed by MR imaging. J Comp Assist Tomogr 1990;14:18–25.
3. Zabramski JM, Wascher TM, Spetzler RF, et al. The natural history of familial cavernous malformations: results of an ongoing study. *J* Neurosurg 1994;80:422–32.
4. Rigamonti D, Drayer BP, Johnson PC, et al. The MRI appearance of cavernous malformations (angiomas). J Neurosurg 1987;67:518–24.
5. Dorsch NWC, Mc Mahon JHA. Intracranial cavernous malformations—natural history and management. CRIT Rev Neurosurg 1998;8:154–68.
6. Moran NF, Fish DR, Kitchen N, et al. Supratentorial cavernous haemangiomas and epilepsy: a review of the literature and case series. *j* Neurol Neurosurg Psychiatry 1999;66:561–68.
7. Sandalcioglu IE, Wiedemayer H, Secer S, et al. Surgical removal of brain stem cavernous malformations: surgical indications, technical considerations, and results. J Neurol Neurosurg Psychiatry 2002;72:351–55.
8. Rigamonti D, Drayer BP, Johnson PC, et al. The MRI appearance of cavernous malformations (angiomas). J Neurosurg 1987;67:518–24
9. Tomlinson FH, Houser OW, Scheithauer BW, et al. Angiographically occult vascular malformations: a correlative study of features on magnetic resonance imaging and histological examination. Neurosurgery 1994;34:792–99.
10. Hsu FGK, Rigamonti D, Huhn SI. Epidemiology of cavernous malformations. En: Auad IA, Barrow DL. Eds. Cavernous malformation. American Association of Neurological Surgeon’s Publications Committee. 1993:13-24.
11. Gomori JM, Grossman RI, Goldberg HI. Occult cerebral vascular malformations: high field MR imaging. Radiology 1986;158:707-713.
12. Del Curling JR. Kelly DL, Elter ad, Craven TE. An analysis of the natural history of cavernous angiomas. J Neurosurg 1991;75:702-708.
13. Giombni S, Morello G. Cavernous angiomas of the brain: Account of fourteen personal cases and review of the literature. Acta Neurochir (Wein) 1978;40:61-82.
14. often P, Pizzolato GP, Rilliet B, Berney J. a propos de 131 cas d´angiomes caverneux (cavernomes) du Snc, repéres par l´analyse retrospective de 24535 autopsies. Neurochirurgie (Paris) 1989;35:82-83.
15. Berenau I, Labauge P, Laberge S, Levy C, Houtteville JP. Familial form of intracranial cavernous angioma: MR imaging findings in 51 families. Radiology 2000; 214:209-216.
16. Hayman LA, Evans RA, Ferrell RE. Familial cavernous angiomas: natural history and genetic study over a 5-year period. Am J Med Genet 1982;11:147–160.
17. Mason I, Aase JM, Orrison WW, et al. familial cavernous angiomas of the brain in a Hispanic family. *Neurology* 1988;38:324–326.
18. Rigamonti D, Hadley MN, Drayer BP, et al. Cerebral cavernous malformations: incidence and familial occurrence. *N Engl J Med* 1988;319:343–347.
19. Ruska JT, Brant-Zawadski M, Wilson CB, et al. Familial cavernous lformations: diagnostic potential of magnetic resonance imaging. *Surg Neurol* 1988;29:467–474.