Revista Información Científica

ISSN 1028-9933
Universidad de Ciencias Médicas de Guantánamo

July 2024 Volume 103 e4465
DOI: https://doi.org/10.5281/zenodo.11110021

CASE REPORT

Brain arteriovenous malformation, Presentation of a case

Malformación arteriovenosa cerebral. Presentación de un caso

Malformação arteriovenosa cerebral. Apresentação do caso

Edisson Javier Fiallos Brito[I]*, Silvina Carolina Villacrés Gavilanes[II]

[I]Universidad Técnica de Ambato. Ambato, Ecuador.
[II]Hospital General Docente Ambato. Ambato, Ecuador.

*** Corresponding author:** xv04@hotmail.com

Received: 06-11-2023 **Accepted:** 28-05-2024 **Published:** 31-07-2024

ABSTRACT

Brain arteriovenous malformations are congenital abnormalities in the vascular network of the brain that can result in brain hemorrhages and seizures due to abnormal communication between arteries and veins. The case of a 7-year-old indigenous boy who was brought to the emergency room due to multiple episodes of vomiting and moderate to high intensity headache was described. He is diagnosed with intraparenchymal hemorrhage, caused by a left temporal brain arteriovenous malformation with intraventricular hemorrhage. After being transferred to a specialized center, cervico-cerebral angiography with embolization of the malformation is performed. The patient is discharged with a prescription for carbamazepine to control the symptoms associated.

Keywords: arteriovenous malformations; embolization; angiography; intraparenchymal hemorrhage; holocranial headache

RESUMEN

Las malformaciones arteriovenosas cerebrales (MAV) son anomalías congénitas en la red vascular del cerebro que pueden resultar en hemorragias cerebrales y convulsiones debido a la comunicación anormal entre arterias y venas. Se describió el caso de un niño indígena de 7 años que es llevado a urgencias por múltiples episodios de vómitos y cefalea de moderada a gran intensidad. Se le diagnosticó una hemorragia intraparenquimatosa causada por una MAV temporal izquierda, con hemorragia intraventricular. Tras ser trasladado a un centro especializado, se realizó angiografía cérvico-cerebral con embolización de la MAV. El paciente fue dado de alta con prescripción de carbamazepina para controlar los síntomas asociados con la MAV y se programó seguimiento cada dos semanas para futuras embolizaciones y rehabilitación física.

Palabras clave: malformaciones arteriovenosas; embolización; angiografía; hemorragia intraparenquimatosa; cefalea holocraneana

ISSN 1028-9933
Universidad de Ciencias Médicas de Guantánamo

RESUMO

Malformações arteriovenosas cerebrais são anomalias congênitas na rede vascular do cérebro que podem resultar em hemorragias cerebrais e convulsões devido à comunicação anormal entre artérias e veias.Foi descrito o caso de um menino indígena de 7 anos que foi levado ao pronto-socorro devido a múltiplos episódios de vômitos e cefaleia de intensidade moderada a alta.Ele é diagnosticado com hemorragia intraparenquimatosa causada por malformações arteriovenosas temporal esquerda, com hemorragia intraventricular.Após transferência para centro especializado, é realizada angiografia cérvico-cerebral com embolização da malformaçõe, seguida de diminuição de 30% do tamanho após tratamento.O paciente recebe alta com prescrição de carbamazepina para controle dos sintomas associados e o acompanhamento é agendado quinzenalmente para futuras embolizações e reabilitação física. As malformações arteriovenosas cerebrais representam um desafio para os profissionais médicos devido ao seu potencial de causar complicações graves.A embolização endovascular apresenta-se como opção terapêutica eficaz, com resultados satisfatórios e pronta recuperação do paciente.

Palavras-chave: malformações arteriovenosas;embolização;angiografia;hemorragia intraparenquimatosa;cefaleia holocraniana

How to cite this article:
Fiallos Brito EJ, Villacrés Gavilanes SC. **Brain arteriovenous malformation, Presentation of a case** . Rev Inf Cient [Internet]. 2024 [citado Access date]; 103:e4465. Available in: http://www.revinfcientifica.sld.cu/index.php/ric/article/view/4465

INTRODUCTION

Cerebral arteriovenous malformations (AVMs) are congenital alterations in the blood vessel network caused by impaired development of the capillary network, which allows intercommunication between cerebral arteries and veins; this is usually a possible cause of cerebral hemorrhages and seizure episodes as, in general, connections of this type are usually weak, so the development of these and other symptoms, including those of neurological focality, is common.(1)

Cerebral vascular malformations manifest themselves clearly during childhood from a clinical point of view. Interestingly, 86-96% of these AVMs in children are located in a specific area of the brain known as the parenchymal-cisternal level. This region acts as an epicenter in brain complexity where crucial neural functions such as memory, learning and language converge. Therefore, the location of these AVMs is of great importance, as it can significantly influence the patient's health and well-being. It is essential that clinicians identify and address these abnormalities appropriately to prevent serious complications and safeguard optimal brain functionality.(2)

Complications of such malformations include cerebral haemorrhage, which is caused by rupture and bleeding of the AVM. The pressure on the walls of the affected arteries and veins increases and they weaken or become thinner. In addition, brain tissues do not easily absorb oxygen from the rapidly flowing blood, which can weaken the tissue and cause it to die completely. The AVM puts too much pressure on thin or weak blood vessel walls, which can cause a blood vessel wall to bulge and rupture. As a result, some AVMs can grow and displace or compress portions of the brain. This can prevent protective fluids from flowing freely in the hemispheres of the brain and cause brain damage.

The brain can be scanned using imaging techniques. Two of the most common techniques for detecting brain arteriovenous malformations (AVMs) are computed tomography (CT) and magnetic resonance imaging (MRI). CT is a technique that uses radiation to create detailed images of the brain. This technique can detect brain AVMs in 85-90% of cases. AVMs are seen as faintly hyperdense, well-defined, irregular images, which do not generate edema and are intensely enhanced by contrast administration.[3]

On the other hand, MRI imaging is effective and uses radio waves rather than radiation to establish detailed images of the brain [4] being more sensitive than CT, it can reveal changes in brain tissues associated with a brain AVM. This provides important information about the exact location of the brain AVM and any related bleeding in the brain, which is crucial for establishing treatment options.[5]

Surgery, embolisation, radiosurgery or a conservative approach may be used to treat the AVM, depending on the patient's clinical condition and treatment preferences. The purpose of this case study is to show how therapeutic embolisation of a malformation was performed using the cervico cerebral angiography technique.

CASE PRESENTATION

The patient, a 7-year-old boy of indigenous race, was brought to the emergency department by his parents, when he suddenly presented multiple episodes of vomiting with food content for more than 8 days, which were accompanied by decay and a holocranial headache that radiated to the occipital region of moderate to great intensity. She had no personal pathological history and her mother had breast cancer detected and was undergoing chemotherapy, and her father had no history of breast cancer. She underwent a thorough physical examination and blood samples were taken. She received oral hydration and was given paracetamol orally 15 mg/kg/dose every 6 hours.

At the time of admission he was conscious, oriented, the episodes of vomiting subsided with oral hydration, intense cervical pain persisted, neck stiffness accompanied by a fever of 38°C, with no previous convulsive events. He was hospitalized for comprehensive management for suspected meningitis.

Clinical findings

Vital signs within normal parameters for his age, the patient was conscious, alert, pale and febrile. Neurological examination showed: Glasgow 14/15, delayed eyelid opening, isochoric pupils reactive to light, nuchal rigidity (+++), no signs of neurological focality.

Laboratory tests on admission. Blood results: leukocytes: 22.51/mm3, neutrophils 93.11/mm3, lymphocytes 4.86/mm3, hemoglobin 13.41 g/dl and platelets 550 cells/mm3. Blood chemistry: urea 14.98 mg/dl, creatinine 0.54 mg/dl, glutamic-oxaloacetic transaminase (GOT) 18 U/L, glutamic-pyruvic transaminase (GPT) 11 U/L, prothrombin time (PT 11) and partial thromboplastin time (PTT) 29.8. Hepatic function was normal, no lumbar puncture was performed.

Twenty-four hours after admission he was assessed by neurosurgery. He underwent a cranial CT scan where a hypertensive image was found at the level of the nuclei of the left base that opens into the ventricular system and left lateral ventricles, causing a midline deviation towards the contralateral side by 0.3 cm (Figure 1).

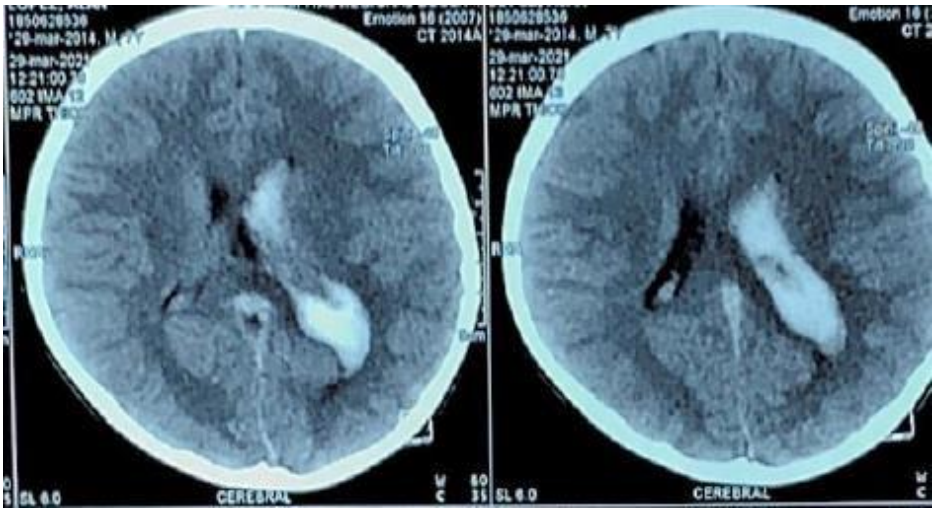

Fig.1. CT image of the skull at 2mm. Hypertensive image opening into the ventricular system and left lateral ventricles

A diagnosis was made of intraparenchymal haemorrhage FISHER IV.6) A simple cerebral MRI was indicated and a grade II left temporal arteriovenous malformation was visualized in the Spetzler Martin categorization, cited by Gallardo,et al;[7] in addition to left intraventricular haemorrhage.

It was decided to transfer him to a specialized centre for therapeutic purposes, where he subsequently underwent cervico-cerebral angiography with embolisation of the malformation (Figure 2).

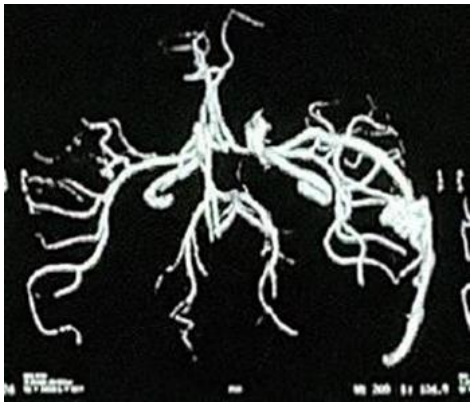

Fig.2. Simple brain MRI image Left temporal arteriovenous malformation grade II in the Spetzler Martin categorization

Diagnostic evaluation

It was reported as a high-flow arteriovenous malformation with a significant fistulous component with shunt to the leptomeningeal veins, located in the left anterior temporal lateral convexity. It measured 15x20x13 mm.

Therapeutic intervention

Embolisation was performed and the patient was returned to the health centre, where he remained stable, without neurological focality, with mild holocranial headache in the days following the procedure.

Follow-up and results

After treatment, the patient was discharged with a 30 % decrease in the size of his AVM compared to the studies performed on admission. For continued care, he was followed up every two weeks to schedule future embolisation and continued physical rehabilitation sessions. In addition, he was prescribed carbamazepine 400 mg per day (200mg orally every 12 hours) to control symptoms associated with the AVM.

DISCUSSION OF THE CASE

Cerebrovascular malformations are a broad and diverse spectrum of lesions that repeatedly present in pediatrics as a diagnostic and therapeutic challenge for health care personnel, coinciding with the study by Martinez, et al.[8]

In the pediatric population, arteriovenous malformations are more common in children between 6 and 12 years of age. About 50% of patients have experienced a rupture of the lesion. Among the most common symptoms is headache and the most frequent malformations usually correspond to grade III of the Spetzler-Martin scale, as cited by Cordero, et al. [9]

In this case study the main symptom was headache and vomiting, which coincided with the clinical findings reported by Cordero, et al. and Torne. [9,10]

Embolisation is used as a surgical procedure, which is appropriate due to the low mortality rate.[9]

This pathology is rare in Ecuadorian patients of paediatric age.[11] The literature generally describes its cause as being related to congenital errors in vascular morphogenesis in the embryonic process,[12] but there is currently a molecular hypothesis that mentions mutations that affect the expression of angiogenic receptors in the phase of blood vessel formation during vasculogenesis.[13]

The 1965 classification of this pathology is still used to describe the magnitude of the findings,[14] because radiological and clinical parameters are considered to assess risk factors and treatment.

Treatment of AVMs may vary according to location, size, symptomatology and general condition of the patient. Endovascular embolisation is less invasive and with good results, characterized by early patient recovery and fewer neurological sequelae; similar results are confirmed by Ding, et al.[15]

Surgery may be necessary to remove the malformation and restore normal blood circulation in the brain, but it is more costly and procedural. Stereotactic radiosurgery is an especially useful option for inoperable AVMs or those located in delicate areas of the brain. In addition to monitored observation and symptom management.

Similar results were described by Guizado, et al. in a case study published in Revista Eugenio Espejo on cerebellar arteriovenous malformation.[12]

FINAL CONSIDERATIONS

Vascular malformations represent a major challenge for vascular surgeons. Tools such as magnetic resonance imaging and angiographic studies are used to diagnose and treat these anomalies. The particularities in the clinical presentation, diagnosis, treatment or evolution of the patient with cerebral arteriovenous malformations motivate the elaboration of a case report to share knowledge, experiences and lessons learned with the medical community.

REFERENCES

1. Family Health Book. Malformación arteriovenosa cerebral. 5ed. Rochester: Mayo Clinic; 2022.
2. Requejo F, Mengide JP, González Dutra ML, Mantese B, Lipsich J. Malformaciones vasculares cerebrales de alto flujo en pediatría: experiencia en un hospital pediátrico de alta complejidad. Rev Arch Arg Ped [Internet]. 2021 [cited 12 Jan 2024]; 119(3):152-161. Available in: https://www.sap.org.ar/docs/publicaciones/archivosarg/2021/v119n3a04.pdf
3. Sartori P, Sgarbi N. Tomografía computada y resonancia magnética de variantes normales/congénitas de apariencia quística y presentación frecuente en el encéfalo. Rev Arg Rad [Internet]. 2019 [cited 12 Jan 2024]; 83(1):12-22. Available in: http://www.scielo.org.ar/scielo.php?script=sci_arttext&pid=S1852-99922019000100003
4. Mayo Clinic. Resonancia magnética [Internet]. 2020 [citado 12 Jan 2024]. Available in: https://www.mayoclinic.org/es-es/tests-procedures/mri/about/pac-20384768
5. Tucson Medical Center. Malformación arteriovenosa cerebral [Internet]. 2022 [cited 12 Jan 2024]. Available in: https://www.tmcaz.com/health-library/conditions/es/con-20129955
6. Bendersky D, Landriel F, Hem S, Knezevich F, Ajler P, Carrizo A. Escalas de fisher original y modificada: correlación con el riesgo de desarrollar vasoespasmo cerebral. Rev Arg Neuroc [Internet]. 2012 [cited 12 Jan 2024]; 26(21):22-26. Available in: https://www.aanc.org.ar/ranc/files/original/0ef206f476ce4a5c8d5ebc298be41116.pdf
7. Gallardo F, Martin C, Chang L, Diaz J, Bustamante J, Rubino P. Utilidad de las escalas de gradación en el tratamiento quirúrgico de malformaciones arteriovenosas cerebrales. Rev Sur Neur Int [Internet]. 2019 [cited 12 Jan 2024]; 10(Suppl 1):S46-S52. Available in: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7159054/
8. Martínez A, Alanís H, Elizondo G, Cabañas E, Morales V. Malformaciones arteriovenosas cerebrales: evolución natural e indicaciones de tratamiento. Rev Med Univ [Internet]. 2009 [cited 12 Jan 2024]; 11(42):44-54. Available in: http://medicinauniversitaria.uanl.mx/42/pdf/44.pdf
9. Cordero A, Espíritu NRA, Yaipen S, Medina D. Características clínico-epidemiológicas y manejo de las malformaciones arteriovenosas cerebrales en el Servicio de Neurocirugía del Instituto Nacional de Salud del Niño San Borja. Rev Horiz Med [Internet]. 2021 [cited 12 Jan 2024]; 21(2):e1332. DOI: https://dx.doi.org/10.24265/horizmed.2021.v21n2.02
10. Torne R, Rodriguez A. Malformaciones arteriovenosas cerebrales: experiencia personal con 121 pacientes tratados con microcirugía. Rev Neurol [Internet]. 2016 [cited 12 Ene 2024]; 62(9):431. Available in: https://neurologia.com/articulo/2016001
11. Hernández C, Gaybor J, Guerra E. Fístulas arteriovenosas congénitas en Ecuador. Rev Cubana Angiol Cir Vasc [Internet]. 2017 [cited 12 Jan 2024]; 18(2):167-177. Available in: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1682-00372017000200004&lng=es
12. Guizado V, Mejía N, Carrera D. Malformación arteriovenosa cerebelosa. Caso clínico. Rev Eugenio Espejo [Internet]. 2019 [cited 12 Jan 2024]; 13(2):71-77. Available in: https://www.redalyc.org/journal/5728/572861392010/572861392010.pdf
13. Campos B, Morán E, García M, Durán C.

Anomalías vasculares más frecuentes en pacientes pediátricos. Parte 2: Malformaciones vasculares. Acta Ped Mex [Internet]. 2020 [cited 12 Jan 2024]; 41(2):85-98. Available in: https://www.medigraphic.com/pdfs/actpedmex/apm-2020/apm202e.pdf

14. Redondo P. Clasificación de las anomalías vasculares (tumores y malformaciones): Características clínicas e historia natural. Anales Sis San Navarra [Internet]. 2004 [cited 12 Jan 2024]; 27(Suppl 1):09-25. Available in: http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1137-66272004000200002&lng=es

15. Ding D, Starke R, Kano H, Mathieu D, Huang P, Feliciano C, *et al*. International multicenter cohort study of pediatric brain arteriovenous malformations. Part 1: Predictors of hemorrhagic presentation. J Neurosurg Ped [Internet]. 2017 [cited 12 Jan 2024]; 19(2):127-35. Available in: https://thejns.org/pediatrics/view/journals/j-neurosurg-pediatr/19/2/article-p127.xml

Declaration of conflicts of interest:
The authors declare that there are no conflicts of interest.

Authors' contribution:
Edisson Javier Fiallos Brito: conceptualisation, data curation, formal analysis, research, project management, resources, supervision, writing - original draft, writing - review and editing.
Silvina Carolina Villacrés Gavilanes: data curation, formal analysis, methodology, validation, writing - original draft, writing - review and editing.

Financing:
No funding was received for the development of this article.