Case series of seizure control post exicison of cavernoma

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SUMMARY

This case series looks into a series of cases involving cavernomas, from 2018- 2021, that underwent surgical intervention within our facility. The cases showed diversity in their locations, with non-eloquent sites consisting of 75%, while the eloquent domain occupied the remaining 25%. Patients presented with seizures in 75% of cases, and weakness in the remaining 25%. Microsurgical resection was offered to our patients. Post excision of cavernoma in these patients' robust seizure control was achieved. Postoperatively, a reduction in anti-epileptic medications was achieved for patients. Some patients became free from seizures. In this series of compelling cases, microsurgery was found to be effective in achieving seizure control.

INTRODUCTION

Cavernomas are vascular abnormalities of the brain. They commonly occur either sporadically or hereditarily. Patients can present in an array of ways, such as seizures, haemorrhages, hydrocephalus, or incidentally. The ideal imaging technique to diagnose this condition is magnetic resonance imaging (MRI) of the brain. The management of this condition relies on the site of the lesion and the symptoms. Treatment options include microsurgical resection, stereotactic radiosurgery, and conservative approaches. We have included all four cases of cavernomas that were operated on at our facility from 2018 to 2021.

CASE PRESENTATION

Case 1: Left Frontal Cavernoma

A 14-year-old Malay girl with no known medical illnesses presented with a generalised tonic–clonic seizure that lasted for 5 minutes. The seizure was preceded by episodes of vomiting. Upon examination, her Glasgow Coma Scale (GCS) was full, and she exhibited no neurological deficits. A plain brain computed tomography (CT) scan was performed, revealing a hyperdense lesion in the left frontal region. Subsequently, a computed tomography angiography of the brain was conducted, revealing an ill-defined hyperdense lesion with subtle enhancements in the left frontal region. An MRI later indicated a hyperintense lesion in the left frontal region, suggestive of a cavernoma with a recent haemorrhage.

Surgery was offered as the lesion was superficial, aimed at improving seizure control and due to the increased risk of recurrent bleeding associated with the presence of recent haemorrhage. On September 6, 2020, a left craniotomy was performed, and the cavernoma was excised. The histopathology report confirmed the diagnosis. Post-operatively, the patient's GCS was full, and she exhibited no neurological deficits. A repeated MRI conducted 3 months later showed no residual lesion. Since the operation, the patient has been seizure-free, despite not being on any anti-epileptic medication.

Case 2: Left Temporal Cavernoma

A 12-year-old girl with no known medical illnesses presented to us with a generalized tonic–clonic seizure that lasted for 30 seconds. Apart from this, her GCS was full, and she exhibited no neurological deficits. A CT scan of the brain revealed a hyperdense lesion in the left temporal region. An MRI was conducted, showing a multiloculated focal lesion with blooming artefacts in the left temporal region. When offered, both the patient and her family were keen on surgery to optimise seizure control compared to medical therapy. On September 22, 2020, a left craniotomy was performed, and the cavernoma was excised. Intraoperatively, a mulberry-like lesion with its hemosiderin deposition was excised. Histopathological analysis confirmed the diagnosis as a cavernoma.

Post-operatively, the patient's GCS was normal, and there were no neurological deficits. The patient has remained seizure-free since her operation, and her dosage of anti-epileptic medication was successfully reduced

Case 3: Right Frontal Cavernoma

A 25-year-old woman presented to us with a history of recurrent seizure episodes since 2012. An MRI conducted in 2013 suggested the presence of a cavernoma in the right frontal lobe. At that time, the patient was counselled for surgery, but she preferred medical therapy. In February 2018, the patient returned with a status epilepticus episode. During examination, her GCS score was E3V1M5, and her pupils were bilaterally reactive with a size of 3/3. The patient was intubated and administered phenytoin. Afterward, she was successfully extubated and returned to her pre-seizure condition. Due to continued poor seizure control despite being on anti-epileptic medication, the patient was once again advised for surgery. On July 17, 2018, a right craniotomy was performed, and the cavernoma was excised. Intraoperatively, the lesion appeared yellowish-grey and vascular, located in the right frontal region.

Following the surgery, the patient was extubated and her GCS was normal upon discharge, with no neurological deficits. Post-operative MRI of the brain revealed no residual

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cavernoma. Currently, the patient remains seizure-free since the operation, despite not being on anti-epileptic drugs.

Case 4: Left Thalamic Bleed

This is a case of a 7–year old boy who presented to us with worsening right sided body weakness and myoclonic seizure of right upper and lower limb. On examination, the child was alert and conscious. However, his right upper and lower limb had a power of 4/5 and the child was having left facial nerve palsy. A plain CT brain was done in which a left thalamic bleed was seen. An MRI brain was then done, in which a left thalamic cavernoma with intracranial bleed at the site was appreciated. Surgery was offered in this child despite the lesion being in a eloquent area as the presence of bleed makes recurrent bleeds of high risk. This child then underwent excision of cavernoma. Lesion resected was sent for histopathology examination, in which it was confirmed to be cavernoma. Post-operative an MRI was repeated for this patient and showed no residual cavernoma. Despite having focal seizure post operative and anti-epileptic medication had to be increased, the patient was subsequently fit–free and his medication dosage was subsequently reduced during follow–up. However, weakness over the right upper and lower limbs was still present.

DISCUSSION

Cavernoma or cerebral cavernous malformation is a vascular abnormality of the brain comprising of abnormal, hyalinized capillaries surrounded by hemosiderin deposit and a gliotic margin.[1] It comprises 10–15% of central nervous system (CNS) vascular malformation and develops in 0.4–0.8% of the population. It is found to be located supratentorial in 46–86%, in the brain stem in 20–35% and basal ganglia in 5–10%.[2] It is said to occur sporadic and hereditary, with multiple lesions being more common with hereditary. However, 12–20% of those that occur sporadic can have multiple lesions.[2] Those which occur hereditarily are said to be inherited in an autosomal dominant manner. Genes which are involved KRIT1(CCM1), malcavernin(CCM2) and PDC10(CCM3).[2]

The presentation of patient's suffering with this condition is usually seizure in 50%, haemorrhage in 25%, neurological deficit without haemorrhage, hydrocephalus or as an incidental finding in 20–50%.[3] Risk of recurrence after the first unprovoked seizure is 94%. Patient has a lower threshold to develop seizure if the cavernoma site is supratentorial, has cortical involvement and mesiotemporal involvement. Risk of haemorrhage in an incidentally discovered cavernoma is 0.08%. It is of higher risk of bleeding if it has bleed previously or if it is brain stem in origin.[2]

The pathophysiology of cavernoma-related epilepsy has not been fully understood. However, certain structural alterations have been studied, which could be the triggering factor. A rim of astroglial reaction, a common finding in cavernomas, could be an epileptogenic factor. Despite the theory of hamosiderin deposits being the triggering factor, many believe that it merely suggests damage has occurred in this area rather than being epileptogenic in nature. Lastly, the leakage of blood components, notably albumin, has been shown to be pro-epileptogenic.[11]

In our series, generalized seizures were seen in 75% of cases, and focal seizures in 25%. Due to a small study group and the absence of proper electroencephalogram data in all our patients, the collected data were not consistent with other research, such as that by Mohamed et al, in which focal seizures were seen in the majority of cases followed by focal seizures with secondary generalisation.[11]

The diagnostic imaging of choice is MRI and more superior if with either gradient echo T2WI or susceptible weighted with high sensitivity to susceptibility artefact from blood breakdown products within and around the cavernoma.[1] Gross appearance of this lesion is said to resemble a mulberry. Microscopically, the smooth muscle layer is absent with endothelial layer showing gapping of tight junctions and sparse or poorly characterised subendothelial smooth muscle cells.

Option of treatment offered for cavernoma is medical therapy, surgery and stereotactic radiosurgery (SRS). Medical therapy is usually chosen when cavernoma are less accessible via surgery, multiple and in non-refractory seizure. No added benefit is seen in surgery over medical therapy in non-refractory seizure.1 Fernández et al noted in their study that surgical intervention for patients with non-refractory epilepsy associated with cavernous malformations did not lead to a significant reduction in the risk of future seizures when contrasted with conservative management. During their investigation, they closely monitored 17 patients who received conservative medical management for a duration of 5 years. Remarkably, 12 of these patients (70.6%) maintained seizure freedom throughout this period.[8] However, there is inadequate randomised control trial conducted to justify the optimal treatment as most of the studies conducted were based on case reviews and did not observe patients for long term. Hence, in view of surgical treatment preventing further neurological deficit and acute haemorrhage, it was found to be more superior in the long-term prognosis of patient. Surgery is usually indicated for accessible lesion with focal deficit, symptomatic haemorrhage or seizure control. For less accessible lesions, surgery is indicated if there is repeated bleed with progressive neurological deterioration. Patients who present with seizure in cavernoma will benefit from complete resection of cavernoma as they are likely to be seizure-free. 75% of patients with supratentorial cavernoma become seizure-free post-resection of cavernoma according to research conducted by Englot et al.[10] Factors which increase successful seizure control in patients post resection of cavernoma are gross total resection, resection within 1 year since presentation, size of cavernoma <1.5cm and having a single cavernoma. Stereotactic radiosurgery is controversial as it is able to reduce risk of recurrent haemorrhage after 2 years latency period from SRS from 32.5 to 10.8%.[1] Lunsford et al demonstrated a reduction in the risk of haemorrhage, decreasing from 32.5% within the initial 2 years to 10.8%, and further declining to just 1% after 2 years.[9] However, was related to an increase in radiation induced morbidity. SRS can be considered in inoperable cavernoma.[1]

CONCLUSION

Cavernoma is a common CNS vascular malformation. The most common presentation of patient with cavernoma is

seizure. Cavernoma are more commonly found supratentorial. MRI brain is highly sensitive in diagnosing cavernoma. The choice of treatment is based on the site of cavernoma and symptoms. The choice of treatment that can be offered is medical therapy and excision of cavernoma. Based on this study excision of cavernoma is related to better control of seizure as patients who underwent complete resection of cavernoma in our centre showed better seizure control.

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patients' consent forms. In the form, the patients have given their consents for their images and other clinical information to be reported in this journal. The patients understand that their name and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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