



ORIGINAL RESEARCH PAPER

Neurosurgery

EXPERIENCE WITH AVMS IN A PERIPHERAL TERTIARY CARE CENTRE

KEY WORDS:

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ABSTRACT

OBJECTIVES:

Surgical management of AVMs has been proven to be challenging but play a definite and time-tested role in its treatment. Due to non-availability of procedures like embolization, radiosurgery and limited resources in a peripheral set up we rely on microsurgical management. We present a series of cases operated over a one year period and their follow-up.

MATERIALS AND METHODS:

To analyze the cases presented in our medical college in the last year from August 2017 to August 2018 and their outcome. A total of 7 cases underwent microsurgical excision of AVMs. The diagnosis of AVM was confirmed by DSA.

RESULTS:

There were 5 males and 2 female patients between the age groups of 38-60 years. Presentation included intracranial bleed in 5(71%), headache and seizures in 2(29%) patients. 4 AVMs involved the right hemisphere and 3 involved the left hemisphere. 2 cases involved frontal lobe, 2 involved temporal lobe, 1 parietal, 1 occipital and 1 multilobar with an associated aneurysm. On DSA 5 had less than 5cm nidus and 2 had more than 5cm. As per Spetzler and Martin: 1 was grade I, 3 were grade II and 3 were grade III.

All the 7 patients underwent microsurgical excision and clipping as required. Complete surgical removal of the AVM was achieved as evidenced by follow up DSA in 6 patients, with significant symptomatic and clinical improvement. One patient deteriorated in the post op period and follow up DSA was not done.

CONCLUSION:

The microsurgical excision of AVMs is fraught with challenges. However if the patients are carefully selected, prepped and meticulous surgery is executed, it offers a single stage complete treatment with acceptable mortality and morbidity, especially in a resource crunched environment like ours.

INTRODUCTION:

Arteriovenous malformations (AVMs) are abnormalities of intracranial vessels that constitute a fistulous connection between the arterial and venous systems and that lack a normal intervening capillary bed. Typically, these lesions are triangular, with the base toward the meninges and the apex toward the ventricular system. AVMs appear as serpiginous isointense or slightly hyperintense vessels that strongly enhance following contrast administration on computed tomographic scanning. Calcification is identified in 25 to 30% of cases. On magnetic resonance imaging (MRI), the typical AVM appears as a tightly packed "honeycomb" of flow voids on T1 and T2 weighted images, caused by high flow velocity signal loss. Phase contrast magnetic resonance angiography (MRA) can be useful in the depiction of flow, but complete definition of complex lesions and their internal angioarchitecture requires a cerebral angiogram. On cerebral angiography, parenchymal AVMs appear as tightly packed masses of enlarged feeding arteries and dilated tortuous veins with little or no intervening parenchyma within the nidus. Arteriovenous shunting with abnormal early filling of veins that drain the lesion is characteristic of AVM.

AVMs are the most frequently detected symptomatic vascular malformation, accounting for 2% of all strokes and 38% of all intracerebral hemorrhages in patients between 15 and 45 years. AVMs are one seventh as common as aneurysms, and the prevalence has been estimated at 0.2% to 0.8% of the general population.

The treatment of arteriovenous malformations (AVMs) has undergone a wide change in the last two decades with the emergence of minimally invasive procedures of endovascular neuro-radiological treatment and the non-invasive method of treatment by radiosurgery. Despite this, the well-established surgical method of treatment constitutes the principal form of treatment. Whilst a small proportion of cases can be primarily treated by embolization alone, this mode of therapy has been seen as an adjunct to surgery. The long-term outcome of radiosurgery and its effects and effectiveness is yet to be assessed.

As the tertiary care center for neurosurgery covering 8 districts in the southern delta region, with a catchment area comprised with a population of 42 lakh people, this study is being undertaken with the goal of providing epidemiological and clinical data on the presentation and management of arteriovenous malformations in an emergency situation in our hospital.

Due to time and financial constraints, surgery plays a vital role in the treatment of these AVMs in the absence of Endovascular intervention procedures in centers like ours. Surgical resection of AVMs is a time proven method for cure from the pathology of AVM. Apart from technical skills necessary to surgically treat AVMs, experience in treating these cases is crucially important.

METHODS:

The patients who were referred or admitted to Thanjavur medical college hospital from August 2017 to August 2018 were included in the study. The data were obtained from review of medical records and imaging studies were available. The information included demographic characteristics, presentation, involved lobe, angiographic characteristics and nidus size, Spetzler-Martin grade, the surgical outcomes, complications and death. Modified Ranklin score (MRS) was used to assess new neurological outcomes due to treatment and was recorded as follows: MRS score of 1 (minor deficits not interfering with lifestyle), MRS score of 2 (minor disability but capable of self-care in all aspects of life), MRS score of 3 (moderate disability requiring some help with self-care), MRS score of 4 (moderately severe disability preventing independence but not requiring constant attention) and MRS score of 5 (severe disability requiring constant attention). Outcome was measured according to downgrade of neurological function due to surgery. Downgrade was defined as new permanent neurological deficit after surgery. Significant morbidity was defined as a decrease in MRS score >1 from baseline. Spetzler-Martin (SM) grade was based on an aggregate on the basis of lesion size, location in eloquent area and pattern of venous drainage. One point was assigned to small (6cm) AVM, one point each for adjacent to eloquent brain and deep venous drainage.

Grade VI referred to extremely large and diffuse AVM, dispersed through critical area.

RESULTS

There were 7 patients admitted or referred to the hospital from August 2017 to August 2018 with an admitting impression of AVM. The mean age of patients was 42.8 years, with a range of 38 to 60 years. There was a male predominance (5, 65%) compared to females (2, 35%). The mean length of hospital stay was 25.2 days (range of 7 to 59 days).

Clinical presentation

The presenting symptoms are listed in Table 1. As shown, majority of patients presented with headache (42.8%). The second most frequent presentation was seizure (28.6%). Uncommon presenting signs included focal weakness, dizziness and loss of consciousness. The average duration of symptoms was 2-3 months. No patient had a family history of AVM.

CLINICAL PRESENTATION	NO OF PATIENTS
FOCAL WEAKNESS	1
HEADACHE	3
SEIZURE	2
LOSS OF CONSCIOUSNESS	1

Incidence of hemorrhage

4 patients had CT scan evidence of intracranial hemorrhage on admission. All patients had cortical hemorrhage with one patient having intraventricular hemorrhage. Thus hemorrhage occurred in 57% of patients

Angiographic characteristics

All patients underwent CT angiogram and majority (4, 57%) had feeders from anterior circulation, 2 patients had feeders from posterior circulation, 1 patient had feeders from both anterior and posterior circulation.

Deep venous drainage was noted in 3 patients. 1 had both superficial and deep venous drainage and the rest of the patients had superficial venous drainage. There were 2 associated aneurysms documented on angiography and both were intracranial.

Spetzler-Martin (SM) grade

There were 5 patients had less than 5cm nidus and 2 had more than 5cm. 4 AVMs were found to involve the right hemisphere and 3 involved the left hemisphere. 2 cases involved frontal lobe, 2 involved temporal lobe, 1 parietal, 1 occipital and 1 multilobar with an associated aneurysm. As per Spetzler and Martin: 1 was grade I, 3 were grade II and 3 were grade III.

Treatment and outcome

All the 7 patients underwent microsurgical excision and clipping as required. Complete surgical removal of the AVM was achieved as evidenced by follow up DSA in 6 patients, with significant symptomatic and clinical improvement. One patient deteriorated in the post op period and follow up DSA was not done.

There was no complication encountered with the patient who was operated with Spetzler Martin grade I. He was discharged with no neurologic deficits. Of the 3 patients with a Spetzler-Martin grade 2, one was discharged with a MRS score of 0. One patient had seizures post-operatively which was controlled with medications. One patient had a homonymous hemianopsia after excision of his occipital AVM. There was no surgical mortality. Two of the three patients with Spetzler-Martin (SM) grade 3 who underwent excision had some neurologic deficits post-operatively, with a MRS score of 1. Both had Medical Research Council (MRC) Grade 4 to 4+/5 weakness of unilateral extremities after excision of their AVM. The percentage of patients with Spetzler-Martin (SM) grade 3 who had neurologic downgrades was 66.7%. The third patient had a MRC Grade 2/5 weakness of his left extremities on admission; he had a right thalamic bleed secondary to his Grade 3 posterior temporal AVM, which had some perforator-type feeders.

He was admitted with a poor GCS of 6(E1V1M4)Post-excision, his weakness had improved to MRC Grade 3. His MRS score was 4. His post-operative period was stormy, with pneumonia and surgical site infection. She was not subjected to post op angiogram. For Spetzler-Martin (SM) Grade 3 patients, the surgical morbidity was 6.3% and there was no surgical mortality.

DISCUSSION

There has been an increase in the number of patients with AVM admitted in our institution. The mean age of patients in this series was 42.8 years. These probably reflect improving diagnostic facilities and early referral to tertiary care centers.

The most common clinical presentation in this series was headache, whereas it was subarachnoid hemorrhage in the majority of other studies. The incidence of hemorrhage in the present study was 57% with no incidence of mortality. This was lower than the estimated mortality rate of 10-29% associated with AVM hemorrhage in a major study. The improved mortality rate may have been partly due to timely evacuation of hematoma.

The mortality rate for Spetzler-Martin (SM) Grade 1 to 3 AVMs in this series was 0%, which was in agreement with the report of Hamilton & Spetzler. This was a major improvement when compared with many series reported in literature. The low surgical morbidity rate for Spetzler-Martin (SM) Grade 1 AVMs of 0% is also in agreement with the series of Hamilton & Spetzler.

For patients with Spetzler-Martin (SM) Grade 2 AVMs, one patient had homonymous hemianopsia. Two other patients had a downgrade of MRS score from 0 to 1 with homonymous hemianopsia. For Spetzler-Martin (SM) Grade 3 AVM patients, the low morbidity rate of 6.3% was also concurrent with that in the report by Hamilton and Spetzler. It has been shown that Spetzler-Martin (SM) Grade 3 AVMs with deep perforating arteries have a similar complication rate to that of Grade 4 to 5 AVMs. Two of the three patients with Spetzler-Martin (SM) Grade 3 AVM in the present series had a downgrade of MRC scores from 0 to 1 with mild limb weakness after excision of AVM. These morbidities were not clinically significant. The third patient had MRS score of 4 from residual limb weakness. However, the muscle weakness preceded the surgical excision and improved marginally after the operation.

In conclusion, the risks of surgery for patients with Spetzler-Martin (SM) grade 1 & 2 AVMs are low. As surgery immediately negates the risk of hemorrhage from the lesion after excision, we believe these low-grade AVMs are best treated with microsurgical resection. Patients with Spetzler-Martin (SM) grade 3 AVMs may undergo microsurgical resection, as surgical morbidity & mortality rates are also low. The microsurgical excision of AVMs is fraught with challenges. However if the patients are carefully selected, prepped and meticulous surgery is executed, it offers a single stage complete treatment with acceptable mortality and morbidity, especially in a resource crunched environment like ours.

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