TREATMENT OF INTRACRANIAL ARTERIOVENOUS MALFORMATIONS (AVMS) WITH GAMMA KNIFE STEREOTACTIC RADIOSURGERY (GKSRS)

Samina Akhtar,[1] ImaadurRehman,[1] Faiza Naz,[1] M. Abid Saleem,[2] Rashid Nazir,[1] Atif Rana[1]

[1] Shifa International Hospital, Islamabad, Pakistan.
[2] Gamma Knife Center,Neurospinal and Medical Institute, Karachi, Pakistan.

PJR July - September 2013; 23(3): 118-121

ABSTRACT

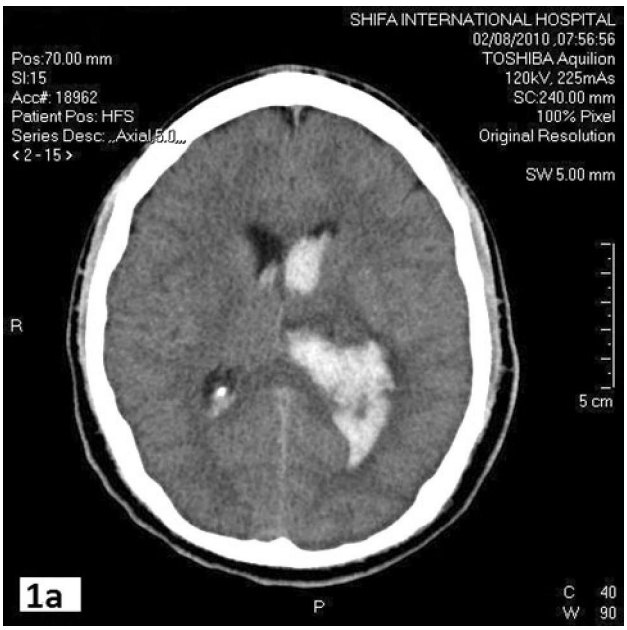
Intracranial arteriovenous malformations (AVMs) are most commonly discovered in young adults as a result of hemorrhage or seizure. Vast majority of these hemorrhages carry significant mortality. We report a case of 27 years old man who presented with left para atrial hemorrhage from an AV malformation. He underwent GKSRS and a year later, was found to be entirely recovered.

Introduction

AV malformations of the brain are focal abnormal conglomerations of dilated arteries and veins connected by one or more fistulae resulting in pathological arteriovenous shunting. Lack of capillary bed and direct arteriovenous connection results in high pressure vascular channels, particularly in veins with fibromuscular thickening and incompetent elastic lamina.[1,2] Gamma knife surgery is accepted as an effective treatment modality for patients with a cerebral AVM.[5] Herein we report a case of hemorrhage from an intracranial arteriovenous malformation diagnosed on CT brain, CT angiography and treated by GKSRS.

Case Report

A 27 years old male presented in emergency department at Shifa International Hospital with sudden loss of consciousness, right sided weakness and aphasia on 29th July 2010. CT brain showed left para-atrial brain parenchymal hemorrhage with extension into the ventricular chain with mild hydrocephalus (Fig. 1).



Correspondence : Dr. Samina Akhtar
Shifa International Hospital,
Islamabad, Pakistan.
Email: saminaakhtar2000@yahoo.co.uk

Submitted 9 November 2014, Accepted 3 December 2014

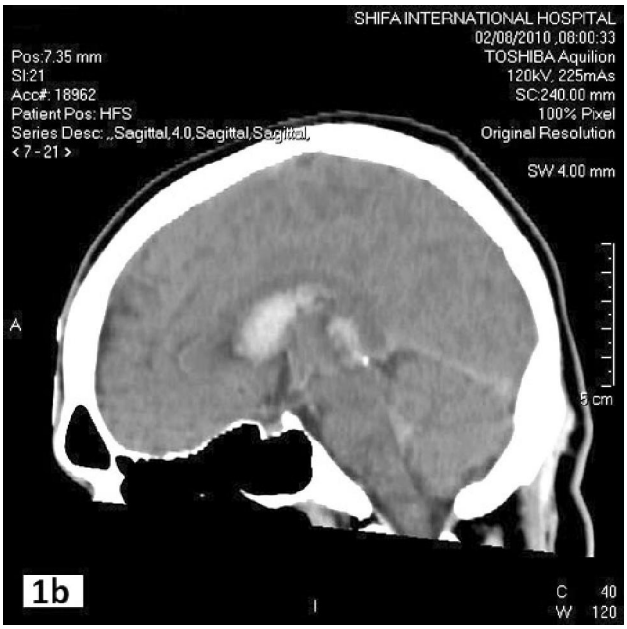


Figure1: Axial (a) and sagittal (b) images of brain showing brain with left intraventricular bleed.

CT angiography revealed deep left parietal AVM supplied by left choroidal artery from posterior cerebral artery (PCA) and another feeder from bifurcation of the left internal carotid artery (ICA) as depicted in (Fig. 2). The patient was managed conservatively for 2 weeks and after stabilization was referred to Gamma Knife center, Neurospinal and Medical institute, Karachi and was treated with Gamma Knife Stereotactic Radiosurgery after 3 weeks of initial presentation.

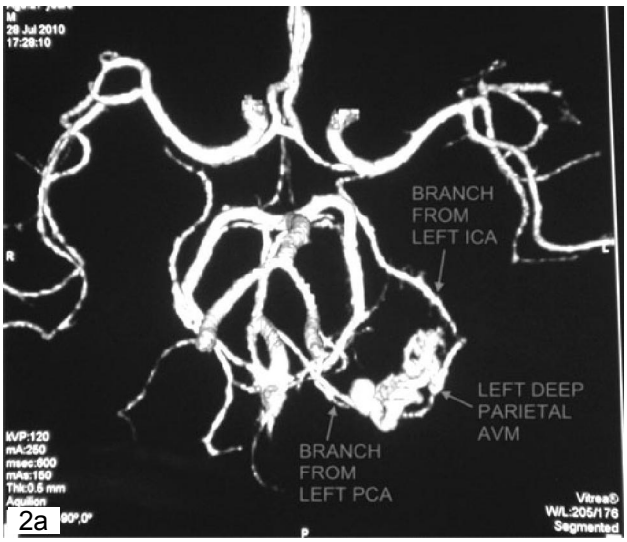


Figure 2: A 3-D reconstructed (a) and MIP images (b) of same patient showing left deep parietal AVM supplied by the labelled arteries.

At the time of presentation, he had mild headache, reduced right vision and weakness of right side of body. Clinical examination revealed right temporal hemianopia, House Brackmann grade II right facial palsy and grade 4 / 5 right hemiparesis. Risks of GKSRS were explained. Our patient was treated with prescription dose of 20Gy to the left deep parietal AVM. He was discharged on tapering doses of Dexamethasone and advised follow up after 6 months.

Figure 3a: CT scan done after 3 months of GKSRS shows resolution of intracranial bleed.

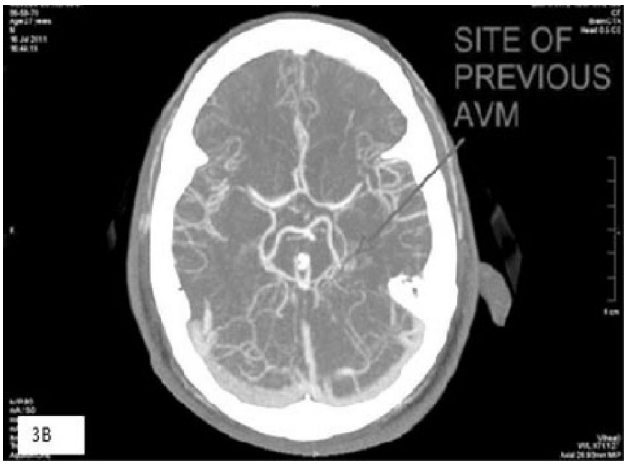


Figure 3b: CT brain angiogram showing almost complete obliteration of previously seen AVM.

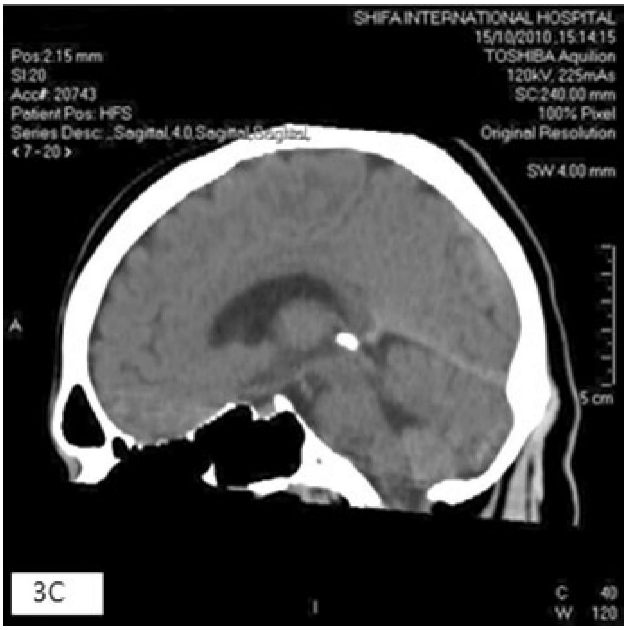


Figure 3c: Shows Post-GKSRS CT brain angiogram revealing almost complete obliteration of the previous AVM.

The follow up CT angiography done a year later showed minimal blush in the left perisplenium location supplied by a branch from left PCA with excellent symptomatic recovery.

Discussion

Arteriovenous malformations can occur anywhere in the central venous system.[1] The most common and catastrophic presenting sign of AV malformation is intracerebral hemorrhage due to associated aneurysm. Seizures, mass effect (from direct compression related to malformation / pressure on surrounding structures) and ischemic steal are other serious sequelae.[1,2]

Vast majority of the cases present with hemorrhage in patients between 20 and 40 years of age.[1,3] Hemorrhage from AVM is attributable to following risk factors: presence of aneurysms (feeding artery, intra nidal or venous), drainage into deep venous sinuses, deep location (i.e. basal ganglia, internal capsule, corpus callosum), a single draining vein, venous stenosis and increasing diameter of malformation.[1,6]

Hemorrhage is associated with 5 - 10 % chance of death and a 30 - 50 % chance of permanent disabling neurologic deficits.[1]

AVM can be diagnosed by CT scans which are sensitive in the detection of acute hemorrhage, supplemented by CTA which provides better vascular details.[1]

Management strategies of AVM include single or combined therapy applying microsurgery, endovascular techniques or radio surgery (focused radiation).[6]

The goal of all these modalities is total obliteration of AVM, restoration of normal cerebral function and preservation of life and neurological function.[4]

Endovascular therapy with acrylate based glues and onyx is usually used for preoperative assistance, or to shrink the mass as much as possible before radiosurgery.[3]

Radiosurgery can be considered in lesions which are at risk from a surgical or endovascular stand point. Radiosurgery is used to treat small AVM with volume < 10 cm or maximum diameter < 3 cm and those located in eloquent brain locations. Candidates for treatment are selected on the basis of AVM volume and location, patient's age, symptoms, angiographic anatomy and relative risk analysis compared with endovascular and surgical therapies.[6]

It seems that there is increasing preference to radiosurgery by both patients and neurosurgeons due to many reasons (i.e refusal of surgery, relatively low complications, short hospital stay). Consequently, more patients with AVM's are being treated by radio surgery than before not necessarily guided by strict selection criteria.[5]

Success with any modality is defined as complete obliteration of AVM which, according to Lindquist and Steiner, is an angiographic appearance with normal circulation time, complete absence of pathological vessels in the former nidus of malfor-mation, and the disappearance or normalization of draining veins from the area.[4]

In our case intracranial AV malformation was treated by GKSRS with excellent recovery.

Gamma Knife Radiosurgery is a very safe and effective alternate modality for treatment of deep intracranial AVMs with successful results. It can achieve very high obliteration rate with minimal morbidity.

References

1. Friedlander RM. Arteriovenous Malformations of the brain. N Engl J Med. 2007 June; **356:** 2704-12.

2. Laza C, Romanitan O, Dorobat B, Nechifor R, Antochi F. Arteriovenous malformation causing hemorrhagic stroke treated by radiosurgery using gamma knife technique. Romanian journal of neurology. 2009; **8(4):** 187-90.

3. Rehman IU, Haq TU, Jooma R, Azeemuddin M, Sajjad Z. Embolization of an intracranial arteriovenous malformation followed by immediate surgical resection: A Case Report. Pak J Neurol Sci. 2008; **3(1):** 9-11.

4. Patel PN, Vyas RK, Bhavsar DC, Suryanarayan UK, Pelagade S, Patel D. Analysis of X-knife and surgery in treatment of arteriovenous malformations of brain. J Can Res Ther. 2008; **4:** 169-72.

5. Choe JG, Im YS, Kim JS, Hong SC, Shin HJ, Lee JI. Retrospective analysis on 76 Cases of cerebral arteriovenous malformations treated by gamma knife radiosurgery. J Korean Neurosurg Soc. June 2008; **43(6):** 265-9.

6. Ogilvi CS, S. Stieg PE, Awad I, Brown RD, Kondziolka JD, Rosenwasser R, Young WL, Hademenos G. Recommendations for the management of intracranial arteriovenous malformations: A statement for healthcare professionals from a special writing group of the stroke council, American Stroke Association. Stroke. 2001; **32:** 1458-71.