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

Samina Akhtar, Imaadur Rehman, Faiza Naz, M. Abid Saleem, Rashid Nazir, Atif Rana

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

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 parietal 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. \(^3\) 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 parietal brain parenchymal hemorrhage with extension into the ventricular chain with mild hydrocephalus (Fig. 1).
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.

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 20 Gy to the left deep parietal AVM. He was discharged on tapering doses of Dexamethasone and advised follow up after 6 months.
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, intranidal 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 standpoint. Radiosurgery is used to treat small AVM with volume < 10 cm³ 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

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 hemorrhage.
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 malformation, and the disappearance or normalization of draining veins from the area. 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


