Arteriovenous malformations are the most common of the congenital blood vessel abnormalities. Simply stated, AVMs are abnormal collections of blood vessels in which the small arteries connect directly with veins. Ordinarily, the blood passing through arterioles enters very small capillaries. Oxygen and nutrients pass through the capillary walls to surrounding cells while cell waste enters the blood stream for disposal. The capillaries have a very small diameter, slowing blood flow and reducing the blood pressure within the stream. Contrarily, in AVMs the high pressure arteriolar blood directly enters the thin-walled veins, bypassing the high resistance capillaries. Over time, the thin wall of the AVM's veins rupture causing spontaneous bleeding within the brain.

The most common problem caused by AVMs is bleeding. Such a stroke can cause temporary or permanent neurological problems and even death. Other symptoms of AVMs include headache, seizures, and progressive neurological deficits. AVMs may be multiple within the brain and can enlarge over time. They may be inherited and passed on to other generations.

Brain AVMs are rare: each year 1.3 people out of 100,000 have an AVM detected. About two-thirds of these people suffer a spontaneous hemorrhage, and about one-third experience a seizure. Among those who have a stroke, about 10% die and 25% experience a persisting neurological deficit and disability. With the increased use of brain imaging, asymptomatic AVMs are increasingly detected. Approximately 15% of AVMs detected each year are incidental findings on brain imaging performed for other reasons and are causing no symptoms.

In individuals who harbor intracranial AVMs the risk of hemorrhage is 4% each year. So we can predict that these individuals have greater than a 2% chance of death or stroke-disability each year. Since

AVMs
are usually detected in younger patients (with long life
expectencies
), their life-long risk of death or disability may be great. Other factors increasing the risk of bleeding include the size of the
AVM
(smaller malformations have a greater risk), obstructed draining veins, aneurysms of feeding arteries or draining veins, and certain positions within the brain.

The ideal treatment is total removal (or obliteration) of the
AVM
nidus
without complications. Treatments include surgery for excision of the
AVM
,
radiosurgery
to obliterate the
nidus
and obliteration by interventional radiology techniques.

Partial surgical removal, or the ligation of feeding arteries, will not cure an
AVM
. The goal of surgery is total removal. All brain surgeries share common potential complications of infection, post-op bleeding and the development of new neurological problems. The risk of neurological injury depends upon the size of the
AVM
, the presence of deep-draining veins, the position of the
nidus
in so-called "eloquent" brain (brain with important functions). Through an analysis of many risk factors,
Spetzler
and Martin published a grading scale based upon these three risk factors in 1986.

As a general rule, Grade I, II, and III
AVMs
can be operated with an acceptable risk of complications (compared to the natural history of untreated
AVM
). Patients with a score of greater than 3 have a high risk of complication and many surgeons recommend non-surgical management.

Small
AVMs
can be obliterated non-invasively with
radiosurgery
. Intense, focused radiation is confined to the
AVM
nidus
in a single treatment. Over time the
AVM
gradually obliterates. Obliteration rates vary from 70% to 90% over a period of 1 to 3 years. During the time it takes for obliteration to develop, there is still a risk of hemorrhage. The Spetzler-Martin
grade does not influence obliteration rates. Factors which do influence obliteration by
radiosurgery
are
AVM
size, position within the brain, and the patient's age.
Radiosurgery
avoids the immediate risks of surgery, such as general anesthetic complications, infection, blood loss, pain, seizures, etc. Delayed neurological deficits from radio-necrosis occur months to years after
radiosurgurgery
and occur in less than 10% of patients treated.

A complex mathematical analysis of the natural history of
AVMs
compared to risks and results of surgery and
radiosurgery
indicate the results of surgery and
radiosurgery
are equivalent and better than no treatment.