Aneurysm

What are Intracranial Aneurysms and how do they occur?

Intracranial aneurysms are localized pathological dilatations of cerebral arteries. Most intracranial aneurysms are saccular or berry aneurysms, whereas dissecting, fusiform, infectious, traumatic, and oncotic aneurysms are much rarer. Saccular, or berry aneurysms, correspond to lobulated focal outpouchings of the wall of the arteries of the circle of willis. It is clinically believed that intracranial aneurysms result from a combination of hemodynamic stresses and acquired degenerative changes within the arterial wall

How does Aneurysm occur?

Aneurysms occurs due to

1) **Subarachnoid Haemorrhage (SAH)** a rupturing of the weak wall, this is experienced as ‘‘the worst headache of life’’ by patients.
2) **Mass effect** causing cranial nerve symptoms
3) **Asymptomatic** mostly detected during imaging done for other reasons
    - It is believed that about 3% - 5% of the population harbours an intracranial aneurysm.
    - One in every 20 strokes is caused by subarachnoid hemorrhage from rupture of intracranial aneurysm,
    - Because the disease strikes at a fairly young age and is often fatal, the loss of productive life years is similar to that for cerebral infarction or intra cerebral hemorrhage

What are the complications of SAH?

Many patients don’t survive initial hemorrhage or suffer significant brain injury due to the hemorrhage. Those who survive have high chances of repeat bleeding which can be fatal in as high as 70-80% of cases. Even if the aneurysm is repaired before re-bleeding, 15% of patients who survive the initial hemorrhage develop ischemic strokes or die from the development of cerebral vasospasm. Non-neurological complications often occur in patients with SAH. These include fever, anemia, hypertension and hypotension, hyperglycemia, hypernatremia / hyponatremia, hypomagnesaemia, cardiac failure and arrhythmias and pulmonary edema and pneumonia. Therefore these patients need intensive care to avoid such problems.

What are diagnostics & cures recommended for SAH?

SAH is a medical emergency that is frequently misdiagnosed. A high level of suspicion for SAH exists in patients with acute onset of severe headache. CT scan is performed on suspected SAH. However, CTs can be negative in some cases particularly when done few days after SAH.

Selective cerebral angiography should be performed in patients with SAH to document the presence and anatomic features of aneurysms**.** MR angiography or CT angiography can be considered when conventional angiography cannot be performed in time.

Early aneurysm treatment should be performed to prevent repeat bleeding. Patients of SAH should be managed in an ICU with good neuroanaesthetic support.


Surgical Clipping

Surgery (clipping) vs Embolization (coiling)

Surgery has been the conventional method to treat aneurysm. It entails direct exposure of aneurysm, parent vessel(s) and surrounding structures. Aneurysm is then secured by the placement of a metallic clip along the neck thereby excluding it from circulation. Problems with surgery include invasiveness and trauma to normal brain parenchyma.

Endovascular Embolization (coiling) of aneurysms is another treatment. In this a microcatheter is placed from one of the leg arteries in to the aneurysm, which is then occluded with coils (usually detachable platinum coils) to prevent repeat bleeding. Since coiling is a minimally invasive technique it is less likely to result in injury to brain parenchyma.


Coiling of aneurysm

International Subarachnoid Aneurysm Trial Study (ISAT)

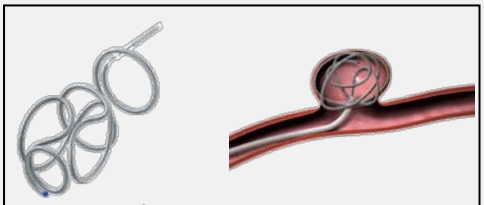
Randomized, prospective, international controlled trial compared policy of neurosurgical clipping with a policy of endovascular treatment in aneurysms deemed suitable for either therapy

9559 patients were screened, 2143 (22.4%) were randomized and the difference in the risk of dependency or death between the two groups was compared

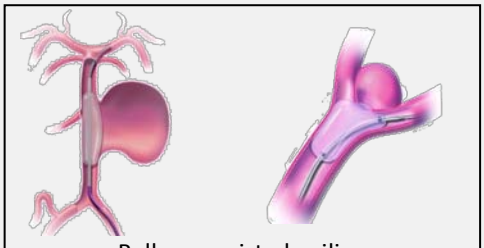
Results: At 1 year outcome was much better in the coiling group with relative risk reduction of 22.6% as compared to surgical patients. The early survival advantage was maintained for up to 7-years. The risk of epilepsy was substantially lower in patients allocated to endovascular treatment. The risk of late re-bleeding was minimally higher (0.16%). The better outcome in coiling group was in spite of minimally increased risk of rebleeding.

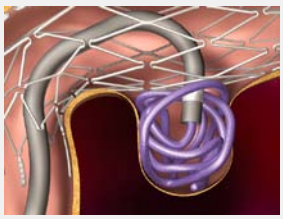
According to recent American Stroke Association guidelines- if both clipping and coiling are possible, coiling is preferable over surgery

Are broad neck aneurysms amenable for coiling?


Coiling of broad neck aneurysm with complex coil

Most broad neck aneurysms can be treated by coiling, with use of 3D and complex coils. These coils are stable even in broad neck aneurysms. Some cases require balloon assisted coiling, where a balloon is inflated temporarily at the neck of the aneurysm to hold the coils. For stent assisted coiling a stent is placed across the neck of a broad neck aneurysm to hold the coils and reconstruct the artery.


Balloon assisted coiling


Stent assisted coiling