A Current Review of Cerebral Aneurysm Treatment: Traditional and Novel Approaches

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A CURRENT REVIEW OF CEREBRAL ANEURYSM TREATMENT: TRADITIONAL AND NOVEL APPROACHES

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Historical Perspective

- 1923- Sir Charles Symonds established subarachnoid hemorrhage (SAH) as a distinct clinical entity

- 1927- Egas Moniz established cerebral angiography, an accurate test to diagnose intracranial aneurysms

- 1937- Walter Dandy established the technique of aneurysm clipping
To Clip? To Coil? or Flow Divert?
Optimal Aneurysm Treatment

Natural History

Indications, Risks and Benefits of Treatment

Durability and Efficacy of Treatment Modality

Aneurysm Characteristics, Location, Size, Neck, Geometry

Local Expertise
Find a team with comprehensive experience!
Endovascular Coiling of Aneurysms
Placement of Microcatheter in Aneurysm
The durability of endovascular clipping versus neurosurgical clipping of ruptured cerebral aneurysms: 18 year follow-up of the UK cohort of the International Subarachnoid Aneurysm Trial (ISAT)

Andrew J. Molyneux, Jacqueline Birk, Alison Clarke, Mary Snaide, Richard S Carr

Summary

Background Previous analyses of the International Subarachnoid Aneurysm Trial (ISAT) risks of recurrent subarachnoid haemorrhage and death or dependency for a minimum maximum of 14 years after treatment of a ruptured intracranial aneurysm with either endovascular clipping. At 1 year there was a 7% absolute and a 24% relative risk reduction of the clipping group compared with the clipping group, but the medium-term results show treatment of the target aneurysm in the patients given clipping. We report the long-term UK cohort.

Methods In ISAT, patients were randomly allocated to either neurosurgical clipping or endovascular clipping after a subarachnoid haemorrhage, assuming treatment equipoise, between Sept 12, 1994, and May 1, 2002. We followed up 1644 patients in 22 UK neurosurgical centres for death and clinical outcomes for 10-18-5 years. We assessed dependency as self-reported modified Rankin scale score obtained through yearly questionnaires. Data for recurrent aneurysms and rebleeding events were collected from questionnaires and from hospital and general practitioner records. The Office for National Statistics supplied data on deaths. This study is registered, number ISRCTN49666811.

Findings At 10 years, 674 (83%) of 809 patients allocated endovascular clipping and 657 (79%) of 835 patients allocated neurosurgical clipping were alive (odds ratio [OR] 1.35, 95% CI 1.06-1.73). Of 1003 individuals who returned a questionnaire at 10 years, 435 (82%) patients treated with endovascular clipping and 370 (78%) patients treated with neurosurgical clipping were independent (modified Rankin scale score 0-2; OR 1.25, 95% CI 0.92-1.71). Patients in the endovascular treatment group were more likely to be alive and independent at 10 years than were patients in the neurosurgery group (OR 1.34, 95% CI 1.07-1.67). 33 patients had a recurrent subarachnoid haemorrhage more than 1 year after their initial haemorrhage (17 from the target aneurysm).

Interpretation Although rates of increased dependency alone did not differ between groups, the probability of death or dependency was significantly greater in the neurosurgical group than in the endovascular group. Rebleeding was more likely after endovascular clipping than after neurosurgical clipping, but the risk was small and the probability of disabling survival was significantly greater in the endovascular group than in the neurosurgical group at 10 years.

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Aneurysm Geometry
Balloon Remodeling and Stents
Stent Assisted Coiling
NEUROFORM Y-STENT CONFIGURATION for WIDE-NECKED BASILAR ANEURYSMS
WIDE-NECKED BASILAR ANEURYSM
POST STENT ASSISTED COILING WITH Y-CONFIGURATION

(2) 3.5 x 20 mm Neuroform stents

210 cm of coils
Flow Diversion

Placement of a low porosity stent across the aneurysmal neck redirects flow away from the aneurysm and back into the parent artery.


Braided mesh cylinder
Platinum nickel-cobalt chromium alloy
Self-expanding, 35% metallic coverage
Variable diameter and
Pore size is 0.02 to 0.05 mm²
PED FLEX, Medtronic

SURPASS, Stryker

FRED, Microvention Terumo

P64, phenox GmbH

SILK, Balt Extrusion
Flow Diversion for Large to Giant Aneurysms

On label indications for PED: aneurysms
>10 mm from petrous ICA to superior
temporal hypophyseal segment
FLOW DIVERSION TRIALS FOR WIDER APPLICATIONS

- **FIAT TRIAL** - stopped prematurely, complete occlusion 60%, major stroke or death 16%

- **PREMIER TRIAL** - complete occlusion 82%, major stroke and death 2.8%

- **DIVERSION TRIAL** - complete occlusion 80%, major stroke and death 7.1%
  - Stroke 2019;50 2019
Flow Diversion for Large Vertebrobasilar Junction Aneurysm

Complete Occlusion 4 months post
PulseRider

Neck Bridging Device

Intrasaccular Aneurysm Flow Diversion

Web Device

- Intrasaccular
- Microcatheters 0.027 for device ≤ 7 mm to 0.032 compatible for device > 7 mm
- Two layers of Nitinol mesh (216 or 288 wires)
- 3 platinum markers
- Retrievable and detachable
Direct Microsurgical Treatment: Indications and Clinical Considerations

- Relieve mass effect from hematoma, CN compression, brain edema
- Direct visualization of side branches and perforators
- Unfavorable aneurysm geometry or size
- Retreatment after failed endovascular attempts
- Need for combined treatment modalities