Endovascular Treatment In Cerebrovascular Diseases

Thaweesak Aurboonyawat, M.D., M.Sc.
Neurosurgery & Interventional neuroradiology
Faculty of Medicine Siriraj Hospital, Mahidol University

Scope

- Ischemic stroke intervention- Embolic stroke, atherosclerotic stenosis
- Hemorrhagic stroke intervention- Aneurysms, AVM
- Hybrid cerebrovascular surgery

Ischemic Stroke intervention

Clots
Acute ischemic stroke treatment

- Intravenous (IV) thrombolysis
- Intra-arterial (IA) approach
  - Intra-arterial (IA) thrombolysis
  - Bridging therapy (No benefit)
- Mechanical thrombectomy
- Intracranial angioplasty and/or stenting

Why IA approach?

- Contraindications for IV thrombolysis
- Out of IV thrombolysis therapeutic window
- Large burden clot

IA approach (Pro)

- Extend the treatment window beyond the limit of 6 – 8 hours
- Mechanically fragmenting a clot increases the surface area accessible to fibrinolytic agents

IA approach (Pro)

- Permits a smaller dose of fibrinolytic agent to reach a higher local concentration (lessen ICH risk)
- Clot-retrieval devices may provide faster recanalization

IA approach (Cons)

- Need experience team
- Need time to treat
- High cost
Case illustration

History

- A 63-year-old man
- Underlying cardiomegaly?? Treated at Thaksin hospital
- He presented with left side weakness and dysarthria for 1 hour

Physical Examination

- BP 144/77 mmHg, pulse 120/min
- E4V5M6, dysarthria
- Language: comprehension, repetitive, fluency - good
- Motor power: Rt grade V, Lt grade II
- Lt facial palsy (UMN)
- Pupil 3 mm BRTL, eye deviate to right side both eyes
- NIHSS 14

CT BRAIN 04.30 AM
Pre

Post

CTP post procedure

1 week post thrombectomy

3 months

Carotid artery stenting for carotid artery stenosis

Carotid endarterectomy (CEA)
Stenting versus Endarterectomy for Treatment of Carotid-Artery Stenosis

**BACKGROUND**—Carotid-artery stenting and endarterectomy are both options for treating carotid-artery stenosis, an important cause of stroke.

**METHODS**—We randomly assigned patients with symptomatic or asymptomatic carotid stenosis to undergo carotid-artery stenting or carotid endarterectomy. The primary composite end point was stroke, myocardial infarction, or death from any cause during the periprocedural period or any postoperative stroke within 4 years after randomization.

**RESULTS**—For 2012 patients over a median follow-up period of 3.5 years, there was no significant difference in the estimated 4-year rate of the primary end point between the stenting group and the endarterectomy group (7.7% vs. 8.0%, respectively; hazard ratio, 1.17 [95% confidence interval, 0.81 to 1.70]; P = 0.31). There was no differential treatment effect with regard to the primary end point among patients with a high preoperative risk for stroke or death (8.6% vs. 6.2%, P = 0.21). The rate of hemorrhagic stroke was 2.7% with stenting and 4.7% with endarterectomy (hazard ratio, 1.96; P = 0.03); the rate among asymptomatic patients was 3.9% and 4.2% (hazard ratio, 1.07; P = 0.62), and the mortality among symptomatic patients was 4.9% and 2.7% (hazard ratio, 1.90; P = 0.07, respectively).

**CONCLUSIONS**—Among patients with symptomatic or asymptomatic carotid stenosis, the risk of hemorrhagic stroke was higher with carotid-artery stenting than with carotid endarterectomy (Clinical Trials.gov identifier: NCT00074123).

Hemorrhagic Stroke intervention

Cerebral aneurysms

**Treatment options**

- Craniotomy with aneurysm clipping
- Endovascular treatment
  - Simple coiling
  - Coiling ± stent or balloon>>wide-necked aneurysms
  - Flow diversion>>Giant or fusiform aneurysms
  - Stent graft
Endovascular treatment compared with neurosurgical treatment was associated with fewer adverse outcomes (6.6% versus 13.2%), decreased mortality (0.9% versus 2.5%), shorter lengths of stay (4.5 versus 7.4 days), and lower hospital charges ($42,044 versus $47,567; combined P<0.05).


- Simple coiling
- Wide-necked aneurysm
- Balloon-assisted coiling
- Low pressure balloon
Balloon-assisted coiling

Stent-assisted coiling

Intraoperative

After procedure

Stent-assisted coiling

Wide-necked ophthalmic aneurysm

Flow diversion with stents
Twin cavernous aneurysms
Previously treated with Neuroform stent w coil on the right
scheduled for Pipeline w coil on the left
Stent deployment. Pipeline Stent

Final control after stenting and coils

Control at 5 months after left ICA treatment with stent

Neuroform w coil  Pipeline w coil

Immediate post stenting  4 month control angiogram

Indications

- Selected cervical or petrous aneurysms
- Traumatic aneurysms
A 70-year-old woman presented with acute right ophthalmoplegia.

Head&neck vascular injuries

A 28-year-old man got a gun shot wound at right side of the neck. He had breathing difficulty after the accident.
Fistula
False aneurysm

Blunt brachiocephalic artery injury

- A 35-year-old man with history of MCA and head injury 3 weeks ago.
- He developed horsiness and had secretion.
- His CXR reveals widening of mediastinum.
- His CT chest and neck study shows traumatic or false aneurysm at right brachiocephalic trunk.
Brain Arteriovenous Malformations
Brain AVM

Treatment options

• Craniotomy with AVM resection - small (<3 cm), superficial non-eloquent location
• Radiosurgery - small (<3 cm), deep location
• Embolization

Rt. Parietal AVM

Onyx embolization

Post-embolization

Hybrid cerebrovascular surgery
Indications of IOA

- Diagnostic cerebral angiography
- Therapeutic embolization
- Surgical treatment assistant

Diagnostic cerebral angiography

Brain AVM resection

Left parieto-occipital AVM

During surgery

Before Resection

After Resection
3 months after surgery

Utility, Safety, and Accuracy of Intraoperative Angiography in the Surgical Treatment of Aneurysms and Arteriovenous Malformations

- Evaluation of the initial angiographic results showed that the lesion was eliminated in 66 cases (67%)
- Surgical procedure was modified with further surgical exploration and resection in 28 cases (29%)
- Three or more intraoperative angiograms were obtained in 10 cases (10%)

Angiography and embolization

Dural AVF

Pre embolization

Post embolization
Angiography assisted surgical treatment

Giant or large aneurysm clipping

Double lumen balloon guiding catheter

Modified Dallas technique

Before

After
Endovascular training and neurosurgeons

Thank you