Surgery of Anterior Circulation Aneurysms
- Make It Easy & Safe

Jae Sung Ahn, MD, 安宰成
Department of Neurosurgery,
Asan Medical Center,
College of Medicine, University of Ulsan,
Seoul, Korea

Introduction
Steps of aneurysm surgery
- Surgical planning
- Position
- Craniotomy
- Arachnoid dissection
- Vascular control
- Aneurysm neck clipping
- Other combined treatment

Uncertainty – expandable
— as wide as possible
— essential

Preop Evaluation

Preop Evaluation – 3D angiography

51F, MCA bifurcation aneurysm
59M, A com a aneurysm

53F, Dizziness

Preop Evaluation

Lt side approach

Rt side approach
During operation
Spliting Sylvian fissure

1. Anatomy of the Sylvian veins

Fig. 5: Specific causes of re-exploration of the craniotomy after surgical treatment of unruptured intracranial aneurysms.
• 11 patients (0.6%, 11/1954)
  - M1 trunk: 5 (3.0%, 5/166)
  - MCA bif: 4 (0.5%, 4/729)
  - A1: 2 (0.8%, 2/240)

AMC series

• 11 patients (0.6%, 11/1954)
  - M1 trunk: 5 (3.0%, 5/166)
  - A1: 2 (0.8%, 2/240)
  - MCA bif: 4 (0.5%, 4/729)

• Mean height of dome: 6.1mm
• Mean length of the neck: 5.7mm
• All aneurysm: dome/neck ratio <2
• Atherosclerosis: 10 patients

  - Impaired perfusion of the MCA territory with M1 stenosis: 3
  - Stenosis or obstruction of M2: 3
  - Obstruction of LSA: 3
  - Obstruction of A1: 2

47M, SAH with ruptured MCA aneurysm
53M, MCA aneurysm

3 D postop

1 mo postop
- 11 patients (0.6%, 11/1954)
  - M1 trunk: 5 (3.0%, 5/166)

77F, MCA bifurcation aneurysm

Preservation of lenticulostriate artery

59F, MCA bifurcation aneurysm
**Indocyanine Green (ICG) angiography**

- **NIR laser light source** (0.16 W, λ = 780 nm)
- **NIR-sensitive digital camcorder**
- **NIR (near-infrared) fluorescent dye**

**Instruements**

**Perforator after aneurysm clipping**

- 7/3F, Unruptured MCA aneurysm

**Tentative clip**

- Decrease volume of the aneurysm
- Better surgical field
- Widened surgical corridor
- Decrease rupture risk
- Easier application of the clip

- 11 patients (0.6%, 11/1954)
- AChA : 2 (0.8%, 2/240)
Internal Carotid Artery Aneurysms - anterior choroidal artery

Dissection & preservation of ant choroidal artery Efficacy of ICG videoangiography, MEP

Wide dissection

F 64, Incidental aneurysm

Preservation of the anterior choroidal artery

F/54, Dizziness
Aborted coil embolization

Internal Carotid Artery Aneurysms - posterior communicating artery
Calcified proximal ICA
Low-lying P com aneurysm
Medial pointing aneurysm

ICA – P com a aneurysm
1. Proximal control
cervical ICA exposure
ACP resection – extradural / intradural partial cut of anterior petroclinoid fold
Cervical ICA exposure

1. Proximal control
   - low lying P com aneurysm, calcified ICA
2. Retrograde suction decompression
3. Highflow bypass

76F, SAH
Low-lying P com a aneurysm

1. Cut anterior petroclinoid fold
2. ACP resection: extradural / intradural

Anterior petro-clinoid fold cut

F 73, Pituitary adenoma, TIA

F 47, Headache
1. Proximal control
   cervical ICA exposure
   ACP resection – extradural / intradural
   partial cut of anterior petroclinoid line

2. Neuroimaging
   calcification of the parent artery
   direction of the aneurysm: medial / lateral
   fetal circulation of the P com

ICA – P com a aneurysm

Anterior Cerebral Artery Aneurysms
- Anterior communicating artery

Deciding approach direction
Rectus gyrus resection
Closure line of aneurysmal neck
Preservation of perforating artery
Surgical planning

Neuroimaging
MR
CT
TFCA

3D angiography

Closure line of aneurysmal neck

46M, A com aneurysm
Surgical tactics

- Careful preoperative planning with CT angiography, MRI, TFCA, balloon test occlusion,
- Intraoperative ICG angiography, MEP, microvascular doppler,
- Don’t be frugal with clips
  - Use aneurysm clips as many as you need
  - Aneurysm clips with various shape, sufficient number
- Closure line of aneurysm neck
- Other unexpected problems - Always prepare Plan B
  bypass surgery – STA, OA, RA, SV, contralateral PICA
cervical ICA exposure, partial clipping followed by coiling
Internal Carotid Artery Aneurysms - ICA paraclinoid

Cervical ICA exposure for proximal control
ACP resection
Patient selection
Vascular control

cervical ICA exposure (with retrograde suction decompression)
petrous portion by drilling Glasscock’s triangle
temporary clip at clinoid ICA
- induced temporary cardiac arrest using adenosine

Cervical ICA exposure
1. Proximal control
   - low lying P com aneurysm, calcified ICA
2. Retrograde suction decompression
3. Highflow bypass

49/F, VF defect

- retrograde suction-decompression technique (JNS 1990)

- Get space for dissection of surrounding structures
- facilitate aneurysm dissection & decrease intraoperative rupture
- Decrease intra-aneurysmal pressure for easy & safe clipping
Retrograde suction-decompression technique

- Get space for dissection of surrounding structures
- Facilitate aneurysm dissection & decrease intraoperative rupture
- Decrease intra-aneurysmal pressure for easy & safe clipping

Removal of the anterior clinoid process

1. Paraclinoid aneurysm, low lying P com a aneurysm
2. ACP resection: extradural / intradural

Intradural Anterior Clinoidectomy

Extradural Anterior Clinoidectomy
Internal Carotid Artery Aneurysms - ICA bifurcation

Neuroimaging
- 3D angiography: aneurysm neck / M1, A1
- Length of the supraclinoid ICA
- Wide splitting of Sylvian fissure
- Retro-carotid approach

Arachnoid dissection
- The deeper, the wider
  - M1 aneurysm (lenticulostriate a)
  - ICA bifurcation
Middle Cerebral Artery Aneurysms

Splitting of Sylvian fissure
Closure line of aneurysmal neck
Preservation of lenticulostriate artery
- neuromonitoring
Wide neck aneurysm
Tentative clip

- Decrease volume of the aneurysm
- Better surgical field
- Widened surgical corridor
- Decrease rupture risk
- Easier application of the clip

Don’t be frugal with clips
Don’t be frugal with clips - aneurysm neck with calcification
Don’t be frugal with clips - aneurysm with wide neck

Parent artery saving
Fusiform aneurysm
47/F, Headache

Anterior Cerebral Artery Aneurysms - A1 segment
- Preoperative balloon test occlusion
- Blind point due to ICA & A1
- Preservation of perforating artery
- Contra-lateral approach
Surgical planning
- preoperative balloon occlusion test

40F, Incidental aneurysm

Carotid compression
Ancillary surgical technique

STA-MCA bypass
- salvage procedure with parent artery occlusion
  ICA, MCA
- suture repair of torn blood vessel

Surgical technique

STA, radial artery, saphenous vein preparation
Interfascial approach
Cervical ICA preparation
ACP resection
60M, MCA aneurysm

70/F, >
Perforator after aneurysm clipping
43M, Unruptured A com a aneurysm

Medial pointing P com a aneurysm
F 41, Incidental aneurysm