Cerebral Revascularization for Complex Aneurysms

Michael T. Lawton, M.D.
Chief, Cerebrovascular Surgery
Professor of Neurological Surgery
Tong-Po Kan Endowed Chair

UCSF Experience:
- Review Period (years): 9.75
- Total Aneurysms: 1650
- Total Patients: 1312
- Total Bypasses: 156
- Bypasses for Aneurysms: 64
- Percent of Aneurysm Cases: 4%

Aneurysm
ICA Occlusion
MCA Stenosis
Vertebrobasilar ischemia
Moyamoya
Skull Base Tumor

Extracranial-Intracranial Bypass

Low-Flow Bypass
- STA-MCA: 7
- STA-PCA: 3
- STA-SCA: 3
- OA-PCA: 1
- Total: 14

High-Flow Bypass
- CCA-MCA (SVG): 5
- ICA-MCA (SVG): 4
- ECA-MCA (SVG): 12
- ICA-MCA (RAG): 1
- ECA-MCA (RAG): 1
- Subclavian-MCA (SVG): 2
- Total: 25

Intracranial-Intracranial Bypass

In Situ Bypass
- ACA-ACA: 2
- MCA-MCA: 2
- PICA-PICA: 4
- Total: 25

Reimplantation
- ACA: 1
- MCA: 2
- PICA: 2

Reanastomosis
- MCA: 4
- PICA: 4
- Total: 25

Intracranial Bypass
- C3-C5, SVG: 2
- VA-SCA, RAG: 1
- ACA-Pericallosal (RAG): 1

Reconstructive Techniques

Technique
- In Situ Bypass
- Reanastomosis
- Reimplantation
- Intracranial Bypass

Anastomosis
- Side-to-Side
- End-to-End
- End-to-Side
- Graft, 2x
In Situ Bypass

ACA-ACA Bypass

STA-MCA Bypass

Endovascular Coiling

Aneurysm Recurrence (1 year)

In Situ Bypass

ATA-MCA Bypass

SLA-MCA Bypass Endovascular Coiling

Excision-Reanastomosis

PICA-PICA Bypass
Classification of Thrombotic Aneurysms

Lawton et al.: Neurosurgery 56: 441-454, 2005

Double Reimplantation

Lawton, Quinones: Neurosurgery 57: 2006

Double Reimplantation

Giant Thrombotic Aneurysm (Type I, concentric)
Computational Modeling

Stroke Volume = 1.9 mls
Stroke Volume = 0.1 mls
Stroke Volume = 1.9 mls
Stroke Volume = 2.3 mls

Flow Reduction, Reversal

AIFA Anastomosis

Callosomarginal Reimplantation

Intracranial-Bypass/Double Reimplantation

In Situ Bypass
- ACA-ACA 2
- MCA-MCA 2
- PICA-PICA 4

Reanastomosis
- MCA 4
- PICA 4
- Total 25

Reimplantation
- ACA 1
- MCA 2
- PICA 2

Intracranial Bypass
- C3-C5, SVG 2
- VA-SCA, RAG 1
- ACA-Pericallosal (RAG) 1
- Total 25

Aneurysm Location
- ICA, Cavernous 2
- MCA 8
- ACoA/ACA 4
- Basilar Trunk 1
- PICA 10
- Total 25

88%
Results

- Bypass Patency: 92% (22/24)
- Good Outcome: 86% (66/77)
- Treatment-related Neurological Morbidity: 5% (4/77)
- Surgical Mortality: 9% (7/77)


Conclusions

- 

Reconstructive techniques remain an important part of vascular neurosurgery
- Bypass strategies are reserved for unclippable and uncoilable aneurysms
- A variety of bypasses is available, each with low risks
- Often used together with endovascular therapies
- Bypass enables safe proximal occlusion or trapping of giant and complex aneurysms

UCSF Center for Stroke and Cerebrovascular Diseases

Bypass Techniques

- STA-PCA, N=6
- PICA–PICA, N=4
- Excision–Reanastomosis, N=4
- ECA–SCA, N=1
- STA-SCA, N=6
- VA–SCA, N=1
- OA–PCA, N=1
- Total, N=59

- PICA Reimplantation, N=2

- N=24
- N=2
- N=1
- N=2
- N=6
- N=3

Bypass Techniques