Anterior communicating artery aneurysm case series

Databases from 10 centers were retrospectively reviewed for unruptured AComm aneurysms treated with flow diverters. Demographics, clinical presentation, radiographic characteristics, procedural complications, and outcomes were assessed.

A total of 144 patients harboring 147 AComm aneurysms were treated between January 2012 and December 2021. Seventy-four were women (51.4%) and median age was 60 (IQR 50-67) years. All were unruptured AComm aneurysms. Half of the cohort had similar anterior cerebral artery sizes (51.4%). The most common morphology was saccular (94.6%), with a branch involvement in 32.7% of cases. Median vessel diameter was 2.4 mm, and the Pipeline Flex was the most prevalent device (32.7%). Median follow-up time was 17 months, with complete occlusion in 86.4% at the last follow-up. Functional independence (modified Rankin Scale score 0-2) was reported in 95.1%. Intraprocedural complications occurred in 5.6%, and postoperative complications were noted in 9.7% of cases. Combined major complication and mortality rate was 2.1%.

The study suggests that flow diverters are a useful treatment for AComm aneurysms. Mid-term results indicated favorable aneurysm occlusion with a good safety profile. Additional prospective studies with longer follow-up periods and independent adjudication are warranted to better assess these results [1)].

As a retrospective study, it may be subject to selection bias, and the data's accuracy and completeness could vary among the participating centers. The lack of randomization also introduces the potential for unmeasured confounding variables. Follow-Up Duration: The median follow-up time of 17 months provides mid-term results. However, the long-term durability of the treatment's effects remains uncertain. Longer follow-up periods would offer a more comprehensive understanding of the outcomes. Non-Adjudicated Data: The study mentions the need for additional prospective studies with independent adjudication to better assess the results. This implies that there may be some subjectivity or variability in outcome assessment that could be addressed in future research. Generalizability: While the multicenter nature of the study enhances generalizability, the findings may still be influenced by regional or institutional practices. Expanding the study to include more diverse populations could further improve its external validity. In conclusion, this study suggests that flow diverters are a promising and safe treatment option for unruptured AComm aneurysms, offering favorable occlusion rates and functional outcomes. Nevertheless, due to its retrospective nature and the need for longer-term data and independent adjudication, further research is required to validate these findings and establish flow diverters as a standard of care for AComm aneurysms.

2020

112 consecutive patients (72 ruptured and 40 unruptured) with ACoA aneurysms from a single-center database. The effects of demographic and morphologic characteristics on the risk of rupture in ACoA aneurysms were tested using univariate and multivariate logistic regression analyses, respectively. Ma et al. found that larger size, greater size ratio, larger flow angle, irregular shape, and smoking of the patient were associated with the rupture of ACoA aneurysms based on univariate analysis. Size ratio (OR = 3.890, P = 0.003), irregular shape (OR = 1.068, P = 0.001), flow angle (OR = 1.054, P =

0.001), and current smoking (OR = 4.435, P = 0.009) were the strongest factors related to ruptured ACoA aneurysms based on multivariate logistic regression analysis. The areas under the curves for the flow angle and size ratio were 0.742 (95% CI 0.646-0.838; P = 0.001) and 0.736 (95% CI 0.621-0.796; P = 0.001), respectively. The strongest risk factors for rupture include size ratio, irregular shape, flow angle, and current smoking. These features should be taken into consideration to aid in the prediction of the rupture risk of ACoA aneurysms [2)].

The objective of a study was to evaluate the utility of microscope-integrated fluorescent ICG video angiography (Flow 800) in anterior communicating artery aneurysm surgery.

Chavan et al. used Flow 800 in ten consecutive patients of A-com aneurysm surgery from July 2019 to October 2019. We studied patient characteristics, intraoperative observation of ICG and Flow 800, and corresponding changes made in the operative decisions.

The use of Flow 800 helped in the intraoperative decision of four out of ten patients of A-com aneurysm. In two patients, incomplete clipping was confirmed with Flow 800 and the second clip was applied. In the third patient, perforator compromise was found hence needed clip readjustment, whereas in the fourth patient, ICG was inconclusive and Flow 800 confirmed complete clipping of aneurysm.

Flow 800 is a conclusive reproducible and objective tool for early detection of vascular compromise of multiple vessels and perforators in A-com aneurysm surgery. It gives a better idea of vasculature, especially where ICG is ambiguous or inconclusive [3)].

2019

Krzyżewski et al. retrospectively analyzed the ACA anatomy of 121 patients with ACoA aneurysms along with 121 age, risk factors, and vessel side-matched control patients without an ACoA aneurysm. We obtained their medical history and digital subtraction angiography (DSA) data from their medical records. For each patient's DSA, we extracted curve representing the course of their ACA and calculated its relative length (RL), sum of angle metrics (SOAM), triangular index (TI), product of angle distance (PAD), and inflection count metrics (ICM).

Patients with ACoA aneurysm had significantly higher RL (0.64 ± 0.23 vs. 0.56 ± 0.22; $p < 0.01$), SOAM (0.27 ± 0.19 vs. 0.18 ± 0.15; $p < 0.01$), PAD (0.12 ± 0.13 vs. 0.09 ± 0.11; $p = 0.02$), and TI (0.57 ± 0.14 vs. 0.44 ± 0.15; $p < 0.01$). In multivariate logistic regression analysis, after adjustment for possible confounders, SOAM (OR, 1.34; 95% CI, 1.12-1.63; $p < 0.01$) and TI (OR, 1.84; 95% CI, 1.47-2.35; $p < 0.01$) remained independently associated with higher risk of ACoA aneurysm. Additionally, we found significant negative correlations between TI and aneurysm dome size ($R = -0.194$; $p = 0.047$).

Increased tortuosity of ACA might increase the risk of ACoA aneurysm development and decrease the risk of aneurysm growth [4)].

The aim of a study was to characterize the clinical profile of patients with anterior communicating

artery (ACoA) aneurysms and examine potential correlations between clinical findings, aneurysm morphology, and outcome.

A review of medical records and diagnostic neuroimaging reports of patients treated at a neurosurgical service in Porto Alegre, Brazil, between August 2008 and January 2015 was performed.

During the period, 100 patients underwent surgery for ACoA aneurysms. Fifteen had unruptured aneurysms and 85 had ruptured aneurysms. Ruptured aneurysms had a higher aspect ratio than unruptured ones (2.37 ± 0.71 vs. 1.93 ± 0.51, P = 0.02). Intraoperative rupture occurred in 3%, and temporary clipping was performed in 15%. Clinical vasospasm occurred in 43 patients with ruptured aneurysms (50.6%). Overall, mortality was 26%; 25 patients in the ruptured group (29.4%) and one in the unruptured group (6%). The Glasgow Outcome Scale (GOS) was favorable (GOS 4 or 5) in 54% of patients, significantly more so in those with unruptured aneurysms (P = 0.01). In patients with ruptured aneurysms, mortality was associated with preoperative Hunt and Hess (HH) score (P < 0.001), hydrocephalus (P < 0.001), and clinical complications (P < 0.001). Unfavorable outcomes were associated with HH score (P < 0.001), Fisher grade (P = 0.015), clinical vasospasm (P = 0.012), external ventricular drain (P = 0.015), hydrocephalus (P < 0.001), and presence of clinical complications (P = 0.001). In patients with unruptured aneurysms, presence of clinical complications was the only factor associated with mortality (P < 0.001).

Despite advances in the management of subarachnoid hemorrhage and surgical treatment of aneurysms, mortality is still high, especially due to clinical complications [5)].

Pietrantonio et al. reviewed all the patients treated surgically at NESMOS Department, “Sapienza” University of Rome, Neurosurgery Unit, Azienda Ospedaliera Santa Maria Gorreti, Latina, Italy, Neurosurgery Unit, Azienda Ospedaliera Cardinale G Panico, Tricase, Italy, Department of Neurology and Psychiatry, Division of Neurosurgery, “Sapienza” University of Rome, from September 1995 to March 2015 for ruptured and unruptured AComA aneurysms. Operative reports, neuroimages, and intraoperative videos were analyzed, and the surgical technique was examined. Illustrative cases are also included.

Complete documentation was available for 223 (75.3%) of the 296 treated patients. Medium-size (55.1%) and superiorly projecting (31.8%) aneurysms were the most represented; 158 patients (70.9%) had different A1 diameters. A left- or right-sided pterional approach was performed in 85 patients (38.1%) and 138 patients (61.9%), respectively. Complete occlusion was documented in 185 patients (83%).

Posterior and superior projections are the most complex to deal with because of the difficult dissection of the perforators and the contralateral A2, respectively. Approaching from the side of the dominant A1 ensures a prompt proximal control. Searching preoperatively for an eventual rotation of the AComA complex and for the location of the A2s can be very helpful for intraoperative orientation [6)].

One hundred and eleven embolizations of ACoA aneurysms (80.7% ruptured and 19.3% unruptured) were retrospectively analysed. The methods of embolization were: coiling, balloon-assisted coiling, stent-assisted coiling. Morphology and dimensions of aneurysms were assessed on 3D digital subtraction angiography (DSA) images. Medical records were analysed for patient's clinical status at admission, intraprocedural complications, follow-up examination and modified Rankin Scale (mRS)

score 1 month after discharge.

Immediately after the procedure 56.9% of patients had Raymond-Roy Occlusion Classification (RROC) class I, 37.6% class II and 5.5% class III. The overall intraprocedural complication rate was 6.6%. There were significantly more cases of bleeding ($p = 0.012$) and coil prolapse ($p = 0.012$) during the procedures ending with higher packing density. Twenty-eight (25.7%) patients died during hospital stay, 27 (96.4%) with ruptured aneurysm. In the follow-up of 41 patients, RROC was the same or improved in 73.2% of cases and recanalization occurred in 26.8%. Six patients with aneurysm recanalization underwent repeat embolization.

Endovascular embolization of ACoA aneurysms is an effective and safe treatment method. The most powerful factor influencing the incidence of complications is packing density. Superior orientation of the dome, initial incomplete embolization and poor outcome in mRS scale are factors predisposing to ACoA aneurysm recurrence [7)].

From 2008 to 2017, 54 anterior communicating artery aneurysms treated were included in a study. Computational fluid dynamics (CFD) techniques were employed and simulations consisted of complete conditions of synchrony and introducing a delay of 0.2s in the non-dominant A1 artery. Time-averaged wall shear stress (TAWSS), low shear area (LSA), A1 diameter and ACoA angles were measured.

The difference in the LSA in conditions of synchrony and asynchrony resulted in a broad range of positive and negative values. The symmetry index ($p=0.04$) and A1/A2 angle on the dominant artery ($p=0.04$) were associated with changes in LSA.

In asynchrony, LSA increased in the absence of A1 asymmetry and low A1/A2 angles, potentially increasing the risk of aneurysm rupture in this location [8)].

A total of 513 patients with microsurgically treated ACoA aneurysms were identified over a 13-year period, and 400 had adequate imaging and follow-up data for inclusion. Surgical clipping was performed on 271 ruptured and 129 unruptured aneurysms. Good outcomes were observed in 91% of patients with unruptured aneurysms and 86% of those with ruptured aneurysms, with a mortality rate $< 1\%$ among patients with unruptured aneurysms. Increasing age ($p < 0.01$), larger aneurysm size ($p = 0.03$), and worse preoperative modified Rankin Scale score ($p < 0.01$) affected outcomes adversely. Aneurysms projecting superiorly and posteriorly required dissection in the junctional triangle, and multivariate analysis demonstrated worse clinical outcomes in these patients ($p < 0.01$).

Anteriorly and inferiorly projecting aneurysms involve only the precommunicating triangle, are simpler to treat microsurgically, and have more favorable outcomes. Superior and posterior dome projections make ACoA aneurysms more difficult to visualize and require opening the junctional triangle. Added visualization through the junctional triangle is recommended for these aneurysms in order to facilitate dissection of efferent branch arteries, careful clip application, and perforator preservation. Dome projection can be determined preoperatively from images and can help anticipate dissection routes through the junctional triangle [9)].

Zhao et al. conducted a retrospective analysis of consecutive 111 patients with a ruptured very small anterior communicating artery aneurysm treated with endovascular coiling or surgical clipping in our single center. Very small aneurysms were defined as aneurysm maximal size ≤ 3.0 mm. Patients were grouped into coiling and clipping groups. Baseline characteristics, postoperative complications, clinical outcomes were compared between the 2 groups.

Forty six (41.1%) patients underwent successfully coiling, and 65 (58.0%) patients underwent surgical clipping including 2 patients who failed coiling and crossed over to surgical clipping. Mean size of ruptured ACoA aneurysms was 2.6±0.5 mm (range, 1.0-3.0 mm). Patients with smaller aneurysms (P=0.028) or A1 segment complete configuration (P=0.009) more often underwent surgical clipping and patients with A1 segment symmetric configuration more often underwent coiling (P=0.011). There were not statistically significant differences in intraoperative rupture, early rebleeding, cerebral infarction and seizure in patients treated with clipping and coiling. Clinical outcomes were similar between the 2 groups. There were no retreatment in both groups.

Patients with very small ruptured ACoA aneurysms can be safely and effectively treated with endovascular coiling. However, smaller ACoA aneurysms still require surgical clipping. A smaller aneurysm size limits the use of endovascular coiling [10].

A retrospective analysis of 47 patients from hospital records who have got admitted in the Banbuntanke Hotokokai Hospital, Nagoya, Japan, from 2014 to 2017, with unruptured A.com.A aneurysm and subsequently operated in the hospital. Demographic factors such as age, sex, and associated with other aneurysms and the morphological characteristics such as aneurysm size, projection, and height were analyzed with postoperative complications and Glasgow outcome scale. Totally 47 cases have been operated in which 26 (55.3%) are female and 21 (44.6%) are male, and the median age is 68 years, 7 (14.89%) patients had middle cerebral artery aneurysm along with A.com.A aneurysm and 1 had internal carotid artery-posterior communicating artery junction aneurysm. Four (8.5%) had chronic subdural hematoma and 1 (2.12%) had epilepsy, 1 (2.12%) case got reoperated, and 1 (2.12%) had hydrocephalus. Moreover, the overall complication rate is 14.89%. For six patients, motor-evoked potential monitoring was used. Forty-six patients had Glasgow outcome scale of 5 and 1 patient had Glasgow outcome scale of 4. There was no mortality in this study. Mean size of the aneurysm was 6.68 mm and the range was 2-25 mm. Mean height was 4.14 mm, 26 (56.52%) A.com.A aneurysm were anteriorly projecting, 9 (19.56%) were superiorly projecting, 8 (17.32%) were inferiorly projecting, and 3 (6.38%) were posteriorly projecting. Morphological parameters such as size, height, and projection were not only highly associated with A.com.A aneurysm rupture and also complications due to clipping of aneurysm [11].

2018

Brain shifts following microsurgical clip ligation of anterior communicating artery aneurysms can lead to mechanical compression of the optic nerve by the clip. Recognition of this condition and early repositioning of clips can lead to reversal of vision loss.

Linzey et al., identified 3 patients with an afferent pupillary defect following microsurgical clipping of ACoA aneurysms. Different treatment options were used for each patient. All patients underwent

reexploration, and the aneurysm clips were repositioned to prevent clip-related compression of the optic nerve. Near-complete restoration of vision was achieved at the last clinic follow-up visit in all 3 patients. Clip ligation of ACoA aneurysms has the potential to cause clip-related compression of the optic nerve. Postoperative visual examination is of utmost importance, and if any changes are discovered, reexploration should be considered as repositioning of the clips may lead to resolution of visual deficit [12].

2017

An asymmetry of the A1 segment of the anterior cerebral artery (A1SA) was identified on digital subtraction angiography studies from 127 patients (21.4%) and was strongly associated with ACoAA ($p < 0.0001$, OR 13.7). An A1SA independently correlated with the occurrence of anterior cerebral artery infarction in patients with ACoAA ($p = 0.047$) and in those without an ACoAA ($p = 0.015$). Among patients undergoing ACoAA coiling, A1SA was independently associated with the severity of ACA infarction ($p = 0.023$) and unfavorable functional outcome ($p = 0.045$, OR = 2.4).

An A1SA is a common anatomical variation in SAH patients and is strongly associated with ACoAA. Moreover, the presence of A1SA independently increases the likelihood of ACA infarction. In SAH patients undergoing ACoAA coiling, A1SA carries the risk for severe ACA infarction and thus an unfavorable outcome. Clinical trial registration no.: DRKS00005486 (http://www.drks.de/) [13].

All cases of ruptured ACoA aneurysms treated by endovascular modalities during BRAT (2003-2007) and post-BRAT (2007-2012) were reviewed for patient and aneurysm characteristics, treatment types, and clinical and angiographic outcomes at 3-yr or last follow-up.

The BRAT ACoA cohort included 39 patients treated with coiling (excluding those crossed over to clipping). The post-BRAT cohort included 93 patients who were significantly older (mean age, 59.5 vs 52.8 yr, P = .005) than the BRAT cohort; there were no significant cohort differences in sex, Hunt and Hess grade, or mean aneurysm size. The use of balloon remodeling was significantly higher in the post-BRAT cohort (31.2% [29/93] vs 5.1% [2/39], P = .001), as was the proportion of wide-necked aneurysms treated (66.7% [62/93] vs 30.8% [12/39], P < .001). There was no significant difference in clinical outcome or retreatment rate between the 2 cohorts (P = .90 and P = .48, respectively).

ACoA lesions thought unamenable to endovascular therapy in an earlier randomized trial are now successfully coiled with increased use of adjunctive techniques, without sacrificing patient outcome or treatment durability [14].

Yang et al. retrospectively reviewed 251 patients with ACoA aneurysm who underwent surgical clipping in Beijing Tiantan Hospital between September 2011 and September 2016. Their clinical and radiologic features, as well as clinical outcomes were reviewed. In addition, univariate and multivariate logistic regression analysis was performed to identify independent risk factors for the postoperative infarction and unfavorable clinical outcomes of surgical clipping ACoA aneurysm.

The incidence of A1 segment hypoplasia was 49.8% (125 of 251 patients). Univariate analysis

revealed that multiple aneurysm (P=0.025), diameter of aneurysm (P=0.040) and A1 segment hypoplasia (P=0.010) were associated with anterior cerebral artery (ACA) territories infarction, and A1 segment hypoplasia (P=0.002) is significantly correlated with unfavorable clinical outcomes of surgical clipping ACoA aneurysm. Moreover, multivariate analysis showed that multiple aneurysm (P=0.038, OR=2.571), diameter of aneurysm (P=0.034, OR=1.097) and A1 segment hypoplasia (P=0.007, OR=3.619) were strongly independent risk factors for ACA territories infarction. In addition, Hunt and Hess scores (HH) (P=0.036, OR=2.326) and A1 segment hypoplasia (P=0.002, OR=2.873) are significant independent risk factors for unfavorable clinical outcomes of surgical clipping ACoA aneurysm.

A1 segment hypoplasia is a significant independent risk factor for unfavorable clinical outcomes of surgical clipping ACoA aneurysm and ACA infarction after surgery [15].

Digital subtraction angiography images were reviewed for 204 patients with either a ruptured or an unruptured ACoA aneurysm. The ratio of the width of the larger A1 segment of the anterior cerebral artery to the smaller A1 segment was calculated. Patients with an A1 ratio greater than 2 were categorized as having A1 segment hypoplasia. The relationship of A1 segment hypoplasia to both patient and aneurysm characteristics was then assessed.

Of 204 patients that presented with an ACoA aneurysm, 34 (16.7%) were found to have a hypoplastic A1. Patients with A1 segment hypoplasia were less likely to have a history of smoking (44.1% vs 62.9%, p = 0.0410). ACoA aneurysms occurring in the setting of a hypoplastic A1 were also found to have a larger maximum diameter (mean 7.7 vs 6.0 mm, p = 0.0084). When considered as a continuous variable, increasing A1 ratio was associated with decreasing aneurysm dome-to-neck ratio (p = 0.0289). There was no significant difference in the prevalence of A1 segment hypoplasia between ruptured and unruptured aneurysms (18.9% vs 10.7%; p = 0.1605).

The results suggest that a hypoplastic A1 may affect the morphology of ACoA aneurysms. In addition, the relative lack of traditional risk factors for aneurysm formation in patients with A1 segment hypoplasia argues for the importance of hemodynamic factors in the formation of ACoA aneurysms in this anatomical setting [16].

Between January 2008 and May 2016, information on 179 consecutive patients with unruptured AcoA aneurysms was obtained and included demographic data, aneurysm features, risk factors for formation and rupture, treatment type, complications, and follow-up information. A 2-tailed t test was used for continuous data and the chi-square test for categorical variables. Statistical significance was set at P value < 0.05.

There were 76 patients 65 and older (42.5%) and 103 younger than 65 (57.5%). Conservative management was more common in older patients (67.1% vs 41.7%, P=0.001). Endovascular treatment was more commonly used in the older population (80% vs 61% of the treated aneurysms in older and younger group, P=0.16). Treatment-related complications were 8% but resulted in permanent neurological deficits in one patient (1.2%). Among conservatively treated aneurysms, three (3.2%) ruptured at follow-up resulting in patient death in two cases (2.4%). All three ruptures occurred in elderly patients.

With a modern approach that emphasizes endovascular therapy, especially in older individuals, unruptured AcoA aneurysms can be treated with a very low morbidity. Among patients with small

aneurysms for which treatment was not deemed indicated or necessary, the rate of rupture at follow-up was not negligible, with 5.8% of older patients experiencing bleeding from the aneurysm [17].

Colby et al., retrospectively reviewed an IRB-approved database of patients with an aneurysm at a single institution for patients with ACoA or A1-A2 aneurysms treated with PED. Data analyzed included demographics, aneurysm characteristics, procedural details, follow-up results, and outcomes.

A total of 50 procedures were performed on 41 patients, including seven patients who underwent bilateral 'H-pipe' PED placement. The average age was 56 years and 46% of the patients were female. The average aneurysm size was 4.5 mm, and two large (>10 mm) aneurysms were treated. The vessel of origin was either the ACoA (26 aneurysms, 63%) or the A1-A2 junction (15 aneurysms, 37%). Eighteen patients (44%) had prior subarachnoid hemorrhage and 20 had previously been treated either with clipping (6 aneurysms, 15%) or coiling (14 aneurysms, 34%). Procedural success was achieved in 48/50 cases (96%) and two cases were aborted. Coils were deployed adjunctively in two cases (4%). Procedural outcomes included no deaths, one major ischemic stroke (2%), and two patients with intracranial hemorrhage (4%). Complete aneurysm occlusion was achieved in 81% of patients at 6 months and 85% of patients at last follow-up digital subtraction angiography.

The PED can be used safely and effectively in the treatment of aneurysms of the ACoA region. This represents a good alternative treatment option to microsurgical clipping and endovascular coiling [18].

2016

A prospectively maintained single-institution neuroendovascular database was accessed to identify consecutive cases of very small (<3 mm) ruptured anterior communicating artery aneurysms treated endovascularly between 2006 and 2013.

A total of 20 patients with ruptured very small (<3 mm) anterior communicating artery aneurysms were consecutively treated with coil embolization. The average maximum diameter was 2.66 ± 0.41 mm. Complete aneurysm occlusion was achieved for 17 (85%) aneurysms and near-complete aneurysm occlusion for 3 (15%) aneurysms. Intraoperative perforation was seen in 2 (10%) patients without any clinical worsening or need for an external ventricular drain. A thromboembolic event occurred in 1 (5 %) patient without clinical worsening or radiologic infarct. Median clinical follow-up was 12 (±14.1) months and median imaging follow-up was 12 (±18.4) months.

This report describes the largest series of consecutive endovascular treatments of ruptured very small anterior communicating artery aneurysms. These findings suggest that coil embolization of very small aneurysms in this location can be performed with acceptable rates of complications and recanalization [19].

Between January 2008 and February 2015, 254 consecutive patients with 255 ACoA aneurysms were treated with coiling. We retrospectively reviewed intraoperative angiograms and medical records to identify intraprocedural rupture and thrombus formation, and re-measured aneurysm morphologies using CT angiography images. Multivariate logistic regression models were used to determine

independent predictors of intraprocedural rupture and thrombus formation.

Of the 231 patients included, intraprocedural rupture occurred in 10 (4.3%) patients, and thrombus formation occurred in 15 (6.5%) patients. Patients with smaller aneurysms more often experienced intraprocedural rupture than those with larger aneurysms (3.5±1.3 mm vs 5.7±2.3 mm). Multivariate analysis showed that smaller ruptured aneurysms (p=0.003) were independently associated with intraprocedural rupture. The threshold of aneurysm size separating rupture and non-rupture groups was 3.5 mm. Multivariate analysis showed that a history of hypertension (p=0.033), aneurysm neck size (p=0.004), and parent vessel angle (p=0.023) were independent predictors of thrombus formation. The threshold of parent vessel angle separating thrombus and non-thrombus groups was 60.0°.

Ruptured aneurysms <3.5 mm were associated with an increased risk of intraprocedural rupture, and parent vessel angle <60.0°, wider-neck aneurysms, and a history of hypertension were associated with increased risk of thrombus formation during coiling of ruptured ACoA aneurysms [20].

2009

In 33 cases among 351 cases of ruptured anterior communicating artery aneurysms treated surgically, from 1991 to 2000, the dome of aneurysm was compressed in optic pathway. In some cases, aneurysm impacted into the optic nerve that deep hollowness was found when the aneurysm sac was removed during operation. Among 33 cases, 10 cases presented with preoperative visual symptoms, such as visual dimness (5), unilateral visual field defect (2) or unilateral visual loss (3), 20 cases had no visual symptoms. Visual symptoms could not be checked in 3 cases due to the poor mental state. In 6 cases among 20 cases having no visual symptoms, optic nerve was deeply compressed by the dome of aneurysm which was seen in the surgical field. Of 10 patients who had visual symptoms, 8 showed improvement in visual symptoms within 6 months after clipping of aneurysms. In 2 cases, the visual symptoms did not recover.

Anterior communicating artery aneurysm can cause visual symptoms by compressing the optic nerve or direct rupture to the optic nerve with focal hematoma formation. Park et al., emphasize that cerebral vascular study is highly recommended to detect intracranial aneurysm before its rupture in the case of normal CT findings with visual symptoms and frequent headache [21].

2003

A prospective study included 223 patients who were divided into three groups: Group A (83 microsurgically treated patients, 1990-1995); Group B (103 microsurgically treated patients, 1996-2000); and Group C (37 patients treated with Guglielmi Detachable Coil [GDC] embolization, 1996-2000). Depending on the direction in which the aneurysm fundus projected, the authors attempted to apply microsurgical treatment to Type 1 aneurysms (located in front of the axis formed by the pericallosal arteries). They proposed the most adapted procedure for Type 2 aneurysms (located behind the axis of the pericallosal arteries) after discussion with the neurovascular team, depending on the physiological status of the patient, the treatment risk, and the size of the aneurysm neck. In accordance with the classification of Hunt and Hess, the authors designated those patients with unruptured aneurysms (Grade 0) and some patients with ruptured aneurysms (Grades I-III) as having good preoperative grades. Patients with Grade IV or V hemorrhages were designated as having poor preoperative grades. By performing routine angiography and computerized tomography

scanning, the causes of unfavorable outcome (Glasgow Outcome Scale [GOS] score < 5) and the morphological results (complete or incomplete occlusion) were analyzed. Overall, the clinical outcome was excellent (GOS Score 5) in 65% of patients, good (GOS Score 4) in 9.4%, fair (GOS Score 3) in 11.6%, poor (GOS Score 2) in 3.6%, and fatal in 10.3% (GOS Score 1). Among 166 patients in good preoperative grades, an excellent outcome was observed in 134 patients (80.7%). The combined permanent morbidity and mortality rate accounted for up to 19.3% of patients. The rates of permanent morbidity and death that were related to the initial subarachnoid hemorrhage were 6.2 and 1.5% for Group A, 6.6 and 1.3% for Group B, and 4 and 4% for Group C, respectively. The rates of permanent morbidity and death that were related to the procedure were 15.4 and 1.5% for Group A, 3.9 and 0% for Group B, and 8 and 8% for Group C, respectively. When microsurgical periods were compared, the rate of permanent morbidity or death related to microsurgical complications decreased significantly (Group A, 11 patients [16.9%] and Group B, three patients [3.9%]); Fisher exact test, p = 0.011) from the period of 1990 to 1995 to the period of 1996 to 2000. The combined rate of morbidity and mortality that was related to the endovascular procedure (16%) explained the nonsignificance of the different rates of procedural complications for the two periods, despite the significant decrease in the number of microsurgical complications. Among 57 patients in poor preoperative grade, an excellent outcome was observed in 11 patients (19.3%); however, permanent morbidity (GOS Scores 2-4) or death (GOS Score 1) occurred in 46 patients (80.7%). With regard to the correlation between vessel occlusion (the primary microsurgical complication) and the morphological characteristics of aneurysms, only the direction in which the fundus projected appeared significant as a risk factor for the microsurgically treated groups (Fisher exact test: Group A, p = 0.03; Group B, p = 0.002). The difference between endovascular and microsurgical procedures in the achievement of complete occlusion was considered significant (chi2 = 6.13, p = 0.01).

The direction in which the fundus projects was chosen as the morphological criterion between endovascular and surgical methods. The authors propose that microsurgical clip application should be the preferred option in the treatment of ACoA aneurysms with anteriorly directed fundi and that endovascular packing be selected for those lesions with posteriorly directed fundi, depending on morphological criteria [22)].

1979

During the 14-year period up to September, 1975, 346 patients with a single anterior communicating artery aneurysm, including eight with unruptured aneurysms, were operated on by direct intracranial procedures. There was an early operative mortality of 5.5%. Follow-up studies, an average of 3 years 11 months after surgery, revealed that about 85% of the survivors, excluding those who could not be followed, had regained their working capacity, and that the late mortality and morbidity rates were 9.6% and 2.0%, respectively. The rationale for performing the intracranial operation and factors influencing postoperative results are discussed, with particular emphasis on the techniques for accurate treatment of aneurysms that help to prevent postoperative rebleeding and therefore give better overall surgical results [23)].

1978

Of 346 patients with direct intracranial surgery for an aneurysm of anterior communicating artery that Kwak et al. experienced from June 1961 to September 1975, 213 patients having sufficient data were

selected to study a relationship between hypoplasia of the A1 of the anterior communicating artery, and sites of an afferent artery and a neck of an aneurysm. 1. Ninety seven of 182 patients who had had the bilateral angiography before surgery had hypoplasia of the right A1, 90 of which (92%) had an afferent artery of an aneurysm only in the left A1. All 29 patients with hypoplasia of the left A1 had an afferent artery of an aneurysm only in the right A1. An afferent artery was limited to the dominant A1 in about 95% of them. 2. Angiography revealed that of 204 patients in whom the neck of an aneurysm in the anterior communicating artery was confirmed, 140 patients had hypoplasia of a unilateral A1. The neck of an aneurysm was located at the bifurcation of the dominant A1 and the anterior communicating artery in 48 of the 140 patient (34.3%), at the bifurcation of the non-dominant A1 and the anterior communicating artery in 14 patients (10.0%), and in the anterior communicating artery itself in 78 patients (55.7%). Cerebral angiography revealed that the neck of an aneurysm was more than 3 times greater at the bifurcation of the dominant A1 and the anterior communicating artery than at the bifurcation of the non-dominant A1 and the anterior communicating artery. 3. The above findings suggest that hemodynamics in the anterior part of the circle of Willis may participate in the initiation, growth, and rupture of an aneurysm of the anterior communicating artery [24].

Kodama et al. reported 346 cases of anterior communicating artery aneurysms were studied. The operative result at discharge was as follows; 19 cases (5.5%) were dead, 27 poor, 39 fair, 64 good and 197 excellent. In the follow-up, out of 300 cases 29 were dead (16 were related to the operation), 7 were poor, 13 fair, 26 good and 226 excellent. Out of 19 dead cases during hospitalization, 14 were operated within two weeks after SAH. Ten out of 14 cases operated within two weeks died due to vasospasm and all these 10 cases were operated between five to 11 days after SAH. These results and results of ultra-early surgery on other sites of aneurysm suggested that the surgery should be avoided on the cases from third to 10th day after SAH. After the 3rd day, the operation should be decided by taking vasospasm into consideration. If the SAH attack is a mojor one accompanying loss of consciousness more than one hour, the operation should be postponed until the 14th day. If the SAH attack is a moderate one accompanying loss of consciousness within one hour, it should be postponed until the 9th or 10th day. When the SAH attack doesn't accompany loss of consciousness, the surgery can be done any time. If stiff neck is obvious, it should be performed on the 9th or 10th day. Our approach for anterior communicating artery aneurysms is a interhemispherical approach following the bifrontal craniotomy. Hypothermic anesthesia around 27 degrees C was used in order to prolong the temporary occlusion time until 1971. Since 1972, 500 approximately 800 ml of 20% mannitol was applied intravenously for preventing the infarction following the temporary occlusion under the normothermic general anesthesia. Details of the operative records of 346 cases were analyzed and our operative method, technique and technical points were discussed [25].

References

1)

Benalia VHC, Cortez GM, Mounayer C, Saatci I, Cekirge HS, Kocer N, Islak C, Dabus G, Brinjikji W, Baltacioglu F, Pereira VM, Nishi H, Siddiqui AH, Monteiro A, Lopes DK, Aghaebrahim A, Sauvageau E, Hanel RA. Safety and Efficacy of Flow Diverters for Treatment of Unruptured Anterior Communicating Artery Aneurysms: Retrospective Multicenter Study. J Neurointerv Surg. 2023 Oct 16:jnis-2023-020673. doi: 10.1136/jnis-2023-020673. Epub ahead of print. PMID: 37845019.

2)

Ma X, Yang Y, Liu D, Zhou Y, Jia W. Demographic and morphological characteristics associated with rupture status of anterior communicating artery aneurysms. Neurosurg Rev. 2020 Apr;43(2):589-595. doi: 10.1007/s10143-019-01080-w. Epub 2019 Jan 31. PMID: 30706157.

3)

Chavan VS, Yamada Y, Chandratej K, Gowtham D, Riccardo S, Firuz S, Yoko K. Intraoperative Use of Microscope-Integrated Flow 800 - A Valuable Tool in Surgical Management of Anterior Communicating Artery Aneurysm: Our Institutional Experience. Asian J Neurosurg. 2020 Feb 25;15(1):26-30. doi: 10.4103/ajns.AJNS_342_19. eCollection 2020 Jan-Mar. PubMed PMID: 32181169; PubMed Central PMCID: PMC7057888.

4)

Krzyżewski RM, Kliś KM, Kwinta BM, Gackowska M, Gąsowski J. Increased tortuosity of ACA might be associated with increased risk of ACoA aneurysm development and less aneurysm dome size: a computer-aided analysis. Eur Radiol. 2019 Nov;29(11):6309-6318. doi: 10.1007/s00330-019-06146-3. Epub 2019 Apr 11. PubMed PMID: 30989348; PubMed Central PMCID: PMC6795631.

5)

Soares FP, Velho MC, Antunes ACM. Clinical and morphological profile of aneurysms of the anterior communicating artery treated at a neurosurgical service in Southern Brazil. Surg Neurol Int. 2019 Oct 4;10:193. doi: 10.25259/SNI_41_2019. eCollection 2019. PubMed PMID: 31637094; PubMed Central PMCID: PMC6800289.

6)

Pietrantonio A, Trungu S, Delfini R, Raco A. Microsurgical Treatment of Anterior Communicating Artery Aneurysms: A 20-year Single-institution Experience. J Neurol Surg A Cent Eur Neurosurg. 2019 Sep 23. doi: 10.1055/s-0039-1685507. [Epub ahead of print] PubMed PMID: 31546264.

7)

Brzegowy P, Kucybała I, Krupa K, Łasocha B, Wilk A, Latacz P, Urbanik A, Popiela TJ. Angiographic and clinical results of anterior communicating artery aneurysm endovascular treatment. Wideochir Inne Tech Maloinwazyjne. 2019 Sep;14(3):451-460. doi: 10.5114/wiitm.2019.81406. Epub 2019 Jan 21. PubMed PMID: 31534577; PubMed Central PMCID: PMC6748064.

8)

Thenier-Villa JL, Riveiro Rodríguez A, Martínez-Rolán RM, Gelabert-González M, González-Vargas PM, Calero-Félix L, Galarraga Campoverde RA, De La Lama Zaragoza AR, Pou J, Alonso CC. A1 asynchrony, a potential risk factor for the rupture of anterior communicating artery aneurysms: A computational fluid dynamics study. Neurocirugia (Astur). 2019 Sep - Oct;30(5):207-214. doi: 10.1016/j.neucir.2019.04.002. Epub 2019 May 30. English, Spanish. PubMed PMID: 31155281.

9)

Ivan ME, Safaee MM, Martirosyan NL, Rodríguez-Hernández A, Sullinger B, Kuruppu P, Habdank-Kolaczkowski J, Lawton MT. Anatomical triangles defining routes to anterior communicating artery aneurysms: the junctional and precommunicating triangles and the role of dome projection. J Neurosurg. 2019 Apr 5:1-12. doi: 10.3171/2018.12.JNS183264. [Epub ahead of print] PubMed PMID: 30952121.

10)

Zhao B, Xing H, Fan L, Tan X, Zhong M, Pan Y, Wan J. Endovascular coiling versus surgical clipping of very small ruptured anterior communicating artery aneurysms. World Neurosurg. 2019 Mar 18. pii: S1878-8750(19)30735-1. doi: 10.1016/j.wneu.2019.03.074. [Epub ahead of print] PubMed PMID: 30898747.

11)

Kasinathan S, Yamada Y, Cheikh A, Teranishi T, Kawase T, Kato Y. Prognostic Factors Influencing Outcome in Unruptured Anterior Communicating Artery Aneurysm after Microsurgical Clipping. Asian J Neurosurg. 2019 Jan-Mar;14(1):28-34. doi: 10.4103/ajns.AJNS_198_18. Review. PubMed PMID: 30937004; PubMed Central PMCID: PMC6417356.

12)

Linzey JR, Chen KS, Savastano L, Thompson BG, Pandey AS. Optic neuropathy after anterior communicating artery aneurysm clipping: 3 cases and techniques to address a correctable pitfall. J Neurosurg. 2018 Jun;128(6):1808-1812. doi: 10.3171/2017.2.JNS162654. Epub 2017 Aug 25. PubMed PMID: 28841123.

13)
Jabbarli R, Reinhard M, Roelz R, Kaier K, Weyerbrock A, Taschner C, Scheiwe C, Shah M. Clinical relevance of anterior cerebral artery asymmetry in aneurysmal subarachnoid hemorrhage. J Neurosurg. 2017 Nov;127(5):1070-1076. doi: 10.3171/2016.9.JNS161706. Epub 2016 Dec 23. PubMed PMID: 28009232.
14)
Moon K, Park MS, Albuquerque FC, Levitt MR, Mulholland CB, McDougall CG. Changing Paradigms in the Endovascular Management of Ruptured Anterior Communicating Artery Aneurysms. Neurosurgery. 2017 Oct 1;81(4):581-584. doi: 10.1093/neuros/nyw051. PubMed PMID: 28327983.
15)
Yang F, Li H, Wu J, Li M, Chen X, Jiang P, Li Z, Cao Y, Wang S. Relationship of A1 segment hypoplasia to the radiological and clinical outcomes of surgical clipping anterior communicating artery aneurysm. World Neurosurg. 2017 Jul 29. pii: S1878-8750(17)31222-6. doi: 10.1016/j.wneu.2017.07.122. [Epub ahead of print] PubMed PMID: 28765030.
16)
Rinaldo L, McCutcheon BA, Murphy ME, Bydon M, Rabinstein AA, Lanzino G. Relationship of A(1) segment hypoplasia to anterior communicating artery aneurysm morphology and risk factors for aneurysm formation. J Neurosurg. 2017 Jul;127(1):89-95. doi: 10.3171/2016.7.JNS16736. Epub 2016 Sep 30. PubMed PMID: 27689465.
17)
Cagnazzo F, Brinjikji W, Lanzino G. Effect of age on outcomes and practice patterns for patients with anterior communicating artery aneurysms. J Neurosurg Sci. 2017 Jan 12. doi: 10.23736/S0390-5616.16.03942-4. [Epub ahead of print] PubMed PMID: 28079351.
18)
Colby GP, Bender MT, Lin LM, Beaty N, Huang J, Tamargo R, Coon A. Endovascular flow diversion for treatment of anterior communicating artery region cerebral aneurysms: a single-center cohort of 50 cases. J Neurointerv Surg. 2017 Jan 27. pii: neurintsurg-2016-012946. doi: 10.1136/neurintsurg-2016-012946. [Epub ahead of print] PubMed PMID: 28130501.
19)
Asif KS, Sattar A, Lazzaro MA, Fitzsimmons BF, Lynch JR, Zaidat OO. Consecutive Endovascular Treatment of 20 Ruptured Very Small (<3 mm) Anterior Communicating Artery Aneurysms. Interv Neurol. 2016 Jun;5(1-2):57-64. doi: 10.1159/000444662. Epub 2016 Mar 22. PubMed PMID: 27610122; PubMed Central PMCID: PMC4934484.
20)
Fan L, Lin B, Xu T, Xia N, Shao X, Tan X, Zhong M, Yang Y, Zhao B. Predicting intraprocedural rupture and thrombus formation during coiling of ruptured anterior communicating artery aneurysms. J Neurointerv Surg. 2016 Apr 5. pii: neurintsurg-2016-012335. doi: 10.1136/neurintsurg-2016-012335. [Epub ahead of print] PubMed PMID: 27183655.
21)
Park JH, Park SK, Kim TH, Shin JJ, Shin HS, Hwang YS. Anterior communicating artery aneurysm related to visual symptoms. J Korean Neurosurg Soc. 2009 Sep;46(3):232-8. doi: 10.3340/jkns.2009.46.3.232. Epub 2009 Sep 30. PubMed PMID: 19844624; PubMed Central PMCID: PMC2764022.
22)
Proust F, Debono B, Hannequin D, Gerardin E, Clavier E, Langlois O, Fréger P. Treatment of anterior communicating artery aneurysms: complementary aspects of microsurgical and endovascular procedures. J Neurosurg. 2003 Jul;99(1):3-14. PubMed PMID: 12854737.
23)
Hori S, Suzuki J. Early and late results of intracranial direct surgery of anterior communicating artery aneurysms. J Neurosurg. 1979 Apr;50(4):433-40. PubMed PMID: 422998.
24)
Kwak R, Ohi T, Niizuma H, Suzuki J. [Relationship between the afferent artery and the site of neck of anterior communicating artery aneurysm, and hemodynamics in the anterior part of the circle of Willis (author's transl)]. No Shinkei Geka. 1978 Dec;6(12):1159-63. Japanese. PubMed PMID: 732933.

25)

Kodama N, Ebina T, Suzuki J. [Surgery of anterior communicating artery aneurysm–from the experiences of 346 cases (author's transl)]. No To Shinkei. 1978 Aug;30(8):895-909. Japanese. PubMed PMID: 708509.