



Data Article

Microneurosurgical management of giant intracranial aneurysms: Datasets of a twenty-year experience ☆☆☆

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ABSTRACT

The data presented in this brief paper aims to summarize the overall results of 82 consecutive patients surgically treated over 20 years for a giant intracranial aneurysm (GIA) in the context of the endovascular era. Data were retrospectively collected from the database of two different tertiary referral Italian hospitals. A retrospective analysis of the patients' cohort was performed. Data are presented as they relate to the demographic and clinical aspects, the

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☆☆ **List of Abbreviations:** ACA: Anterior Cerebral Artery; ACoA: Anterior Communicating Artery; AICA: Anterior-Inferior Cerebellar Artery; BTO: Balloon Test Occlusion; CT: Computed Tomography Scan; DSA: Digital Subtraction Angiography; GIA: Giant Intracranial Aneurysm; ICA: Internal Carotid Artery; MCA: Middle Cerebral Artery; mRS: modified Ranking Scale; PCA: Posterior Cerebral Artery; PICA: Posterior Inferior Cerebellar Artery; SAH: Subarachnoid Hemorrhage; SCA: Superior Cerebellar Artery; VBJ: Vertebrobasilar Junction.

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prevalence of GIAs according to anterior and posterior circulation, aneurysm angioarchitectural features, surgical treatment options, complications, outcome, and main microneurosurgical techniques required explicitly for GIAs, namely temporary clipping, aneurysm remodeling, thrombectomy, fragmentation, and bypass. Furthermore, data about the effects of implementing the flow-diverter/flow-disruptor on the surgical case volume over the years are also reported. The data presented herein are related to our previously published research article titled "Surgical Management of Giant Intracranial Aneurysms: Overall Results of a Large Series" (2020) [1].

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Specifications Table

Subject	Clinical Neurology
Specific subject area	Giant Intracranial Aneurysms
Type of data	Tables, Graphs, Figures
How data were acquired	Medical charts and surgical videos of 82 consecutive patients surgically managed for giant intracranial aneurysms in two different Italian hospitals were retrospectively reviewed. All collected data were examined and analyzed using a statistical software program.
Data format	Raw, analyzed, and partially filtered.
Parameters for data collection	Dataset consisted of collecting aspects regarding demographics, pre- and postoperative neurological status of patients' cohort, pre- and postoperative 2- and 3-dimensional CT angiography and digital subtraction angiography, as well as surgical treatment options.
Description of data collection	We retrospectively collected data from 82 patients with giant intracranial aneurysms who underwent surgical treatment. Medical charts, surgical videos, pre- and postoperative images were reviewed. Overall clinical outcome was reported as modified Ranking Scale scores evaluated at 6-month follow-up.
Data source location	San Salvatore City Hospital, L'Aquila, Italy Fondazione IRCCS Policlinico San Matteo, Pavia, Italy
Data accessibility	With the article
Related research article	Authors' names: Sabino Luzzi M.D., Ph.D.1,2, Cristian Gragnaniello, M.D., Ph.D.3, Alice Giotta Lucifero M.D.1, Mattia Del Maestro M.D.2,4, Renato Galzio M.D.5. Title: Surgical Management of Giant Intracranial Aneurysms: Overall Results of a Large Series Journal: World Neurosurgery (2020) 10.1016/j.wneu.2020.08.004 . [1]

Value of the Data

- The natural history of GIAs is characterized by an annual bleeding risk of 8% and 10% for anterior and posterior circulation, respectively, increasing up to 40% and 50% as 5-years cumulative risk. Possible ischemic events due to the distal embolization of thrombotic material from the aneurysm are sources of further concern. These data account for a 2-year mortality rate greater than 60% for untreated GIAs. Accordingly, the treatment of these aneurysms is mandatory, although challenging.

- Through an overview of the overall results of 82 consecutive patients surgically treated for GIAs over 20 years, the present dataset can be useful to neurosurgeons and interventional neuroradiologists facing this complex pathology.
- This dataset is useful for critical appraisal of the results from the microneurosurgical management of GIAs as well as a potential starting point for the development of new surgical techniques according to site and angioarchitecture.
- Within the landscape of the multiple treatment options available nowadays for these aneurysms, increasingly involving endovascular techniques, this dataset's critical interpretation could contribute to the implementation and further development of more reliable management algorithms for these complex vascular lesions.

1. Data Description

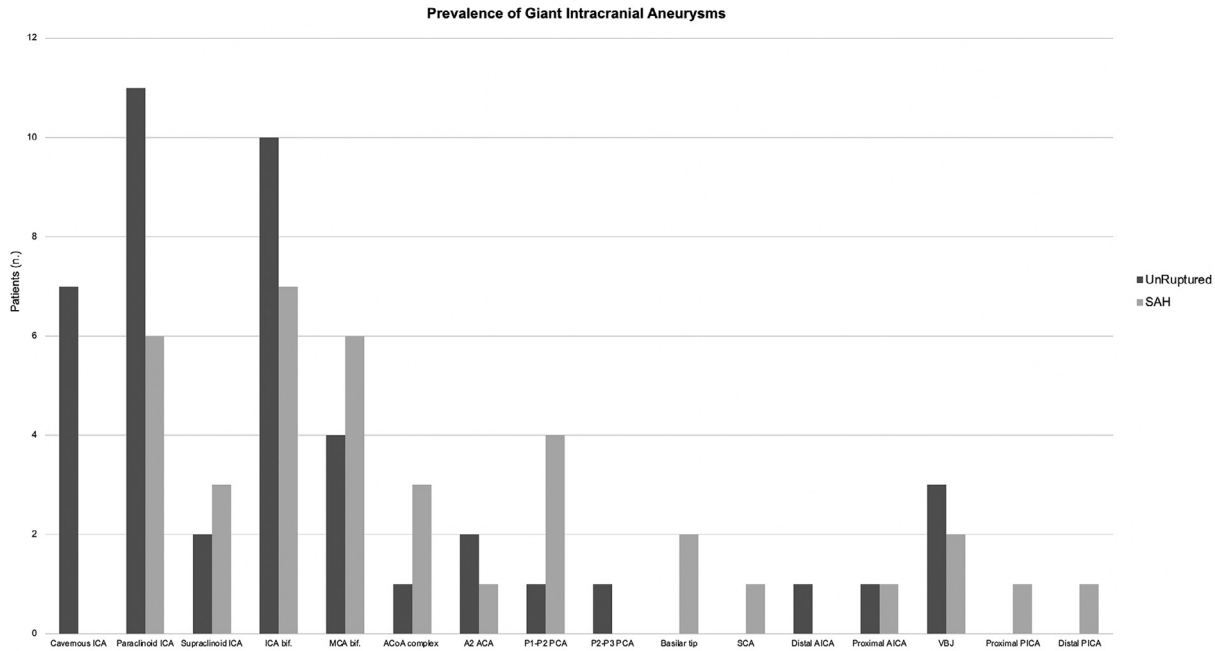
82 GIAs were consecutively treated in a timeframe of 19 years, since January 2000. The average patient age was 53 years, with a slightly higher prevalence in males. Subarachnoid hemorrhage occurred in 46.3% of patients. Anterior and posterior circulation were involved in 76.8% and 23.2% of cases, respectively (Table 1). The cavernous, paraclinoid and supraclinoid segment of the ICA were the most involved in the anterior circulation, along with the bifurcation point of the ICA and MCA. Posterior circulation GIAs had the highest incidence at the level of proximal PCA, VBJ, and proximal PICA (Graph 1). Clip reconstruction with or without bypass and bypass with proximal parent vessel occlusion or aneurysm trapping were performed in 90.2% and 8.5% of cases, respectively (Graph 2). Ischemia in the territory of one or more perforating arteries was the most frequent complication observed, especially in the first decade. Delayed bypass occlusion occurred in three cases (Graph 3). A good-moderate outcome (mRS 0–3) was observed in 84.1% of patients (Graph 4). In our cohort, the advent of flow-diverters/flow disruptors reduced the number of GIAs of the cavernous and paraclinoid ICA, and VBJ that were surgically treated, leaving other sites unaffected (Graph 5).

In the present series, irrespective of the location, hemorrhagic onset was a predictor of poor outcome.

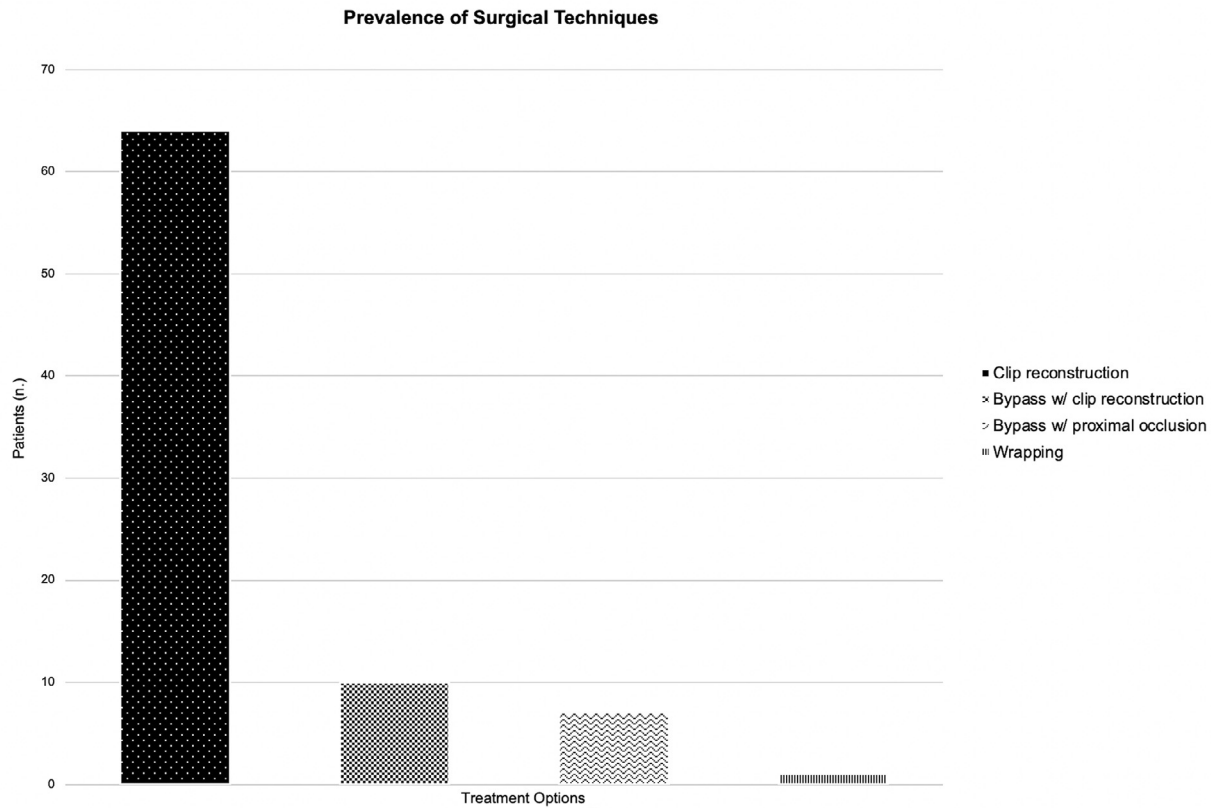
We report two surgical videos; one showing a clip reconstruction case and the second showing a bypass. The first patient was a 48-year-old male surgically treated for an incidental giant and calcified anterior communicating artery (ACoA) aneurysm. A left cranio-orbital approach allowed for an early and full hemodynamic control of the entire ACoA complex in this case. Aneurysmectomy and progressive clip reconstruction of the neck with the stacking-seating

Table 1
Demographic Data of the Patients' Cohort.

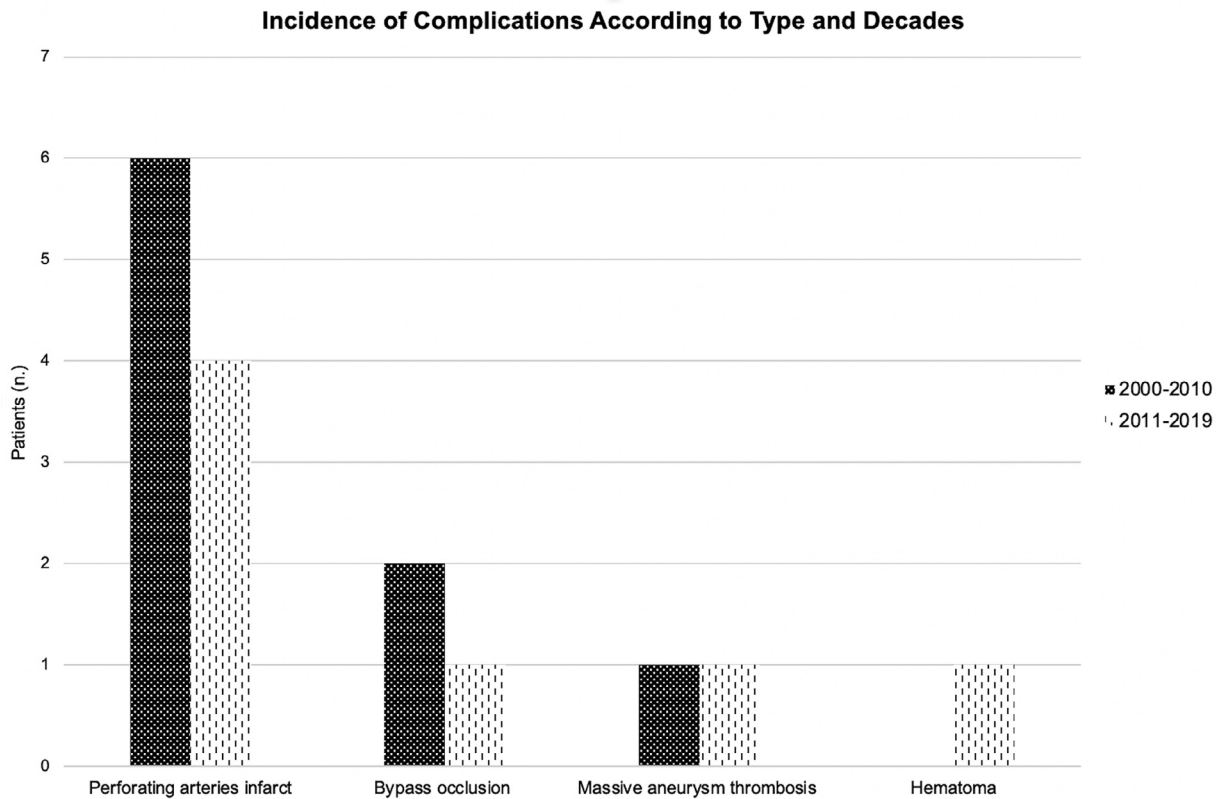
Parameter				Data
Overall GIAs (n.)				82
Average Age (years±SD)				53±14
Male/female ratio				1.3
Hemorrhagic onset (n.)				38
Multiple aneurysms (n.)				4
Anterior Circulation				63
Posterior Circulation				19
Outcome Comparison (Chi-squared test, $p < 0.05$)				p-value
Site	n.	Good (mRS 0–3) (n.)	Poor (mRS 4–6) (n.)	0.479
Anterior Circulation	63	54	9	
Posterior Circulation	19	15	4	
Onset	n.	Good (mRS 0–3) (n.)	Poor (mRS 4–6) (n.)	0.015
Hemorrhagic	38	28	10	
Non-Hemorrhagic	44	41	3	



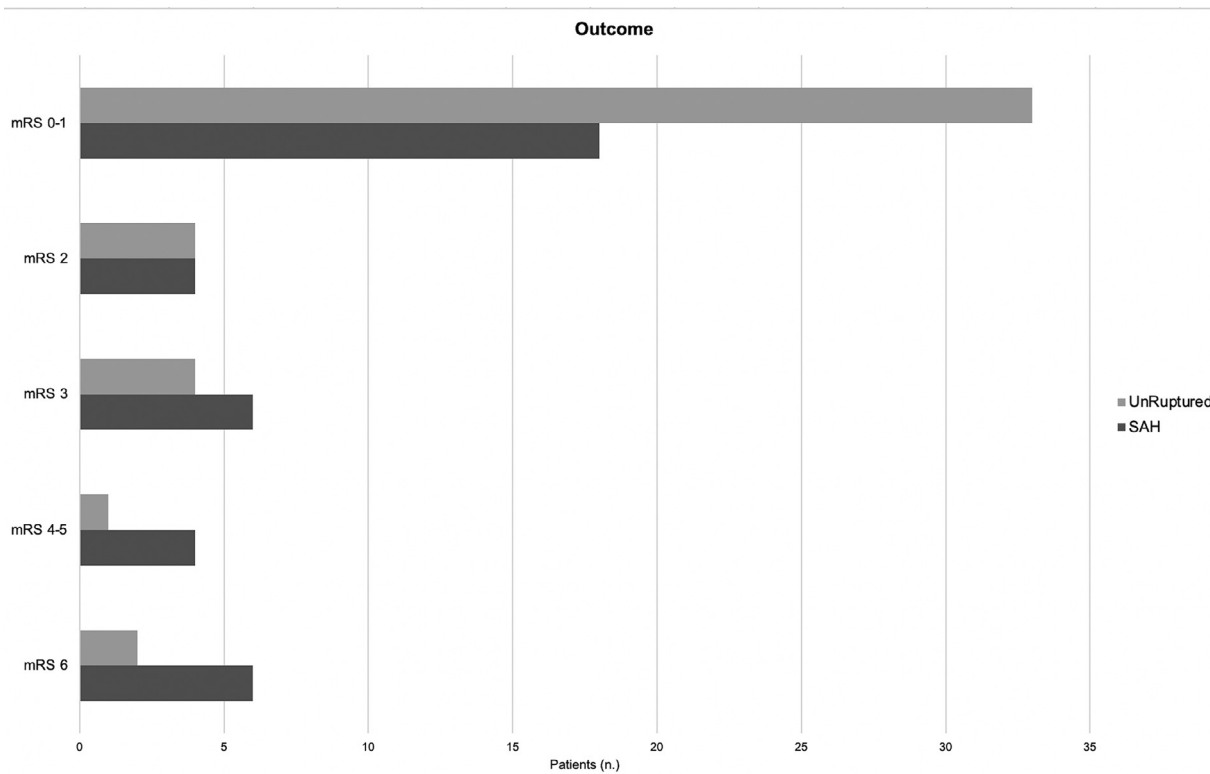
Graph. 1. Bar graph showing the different prevalence of giant intracranial aneurysms according to site.



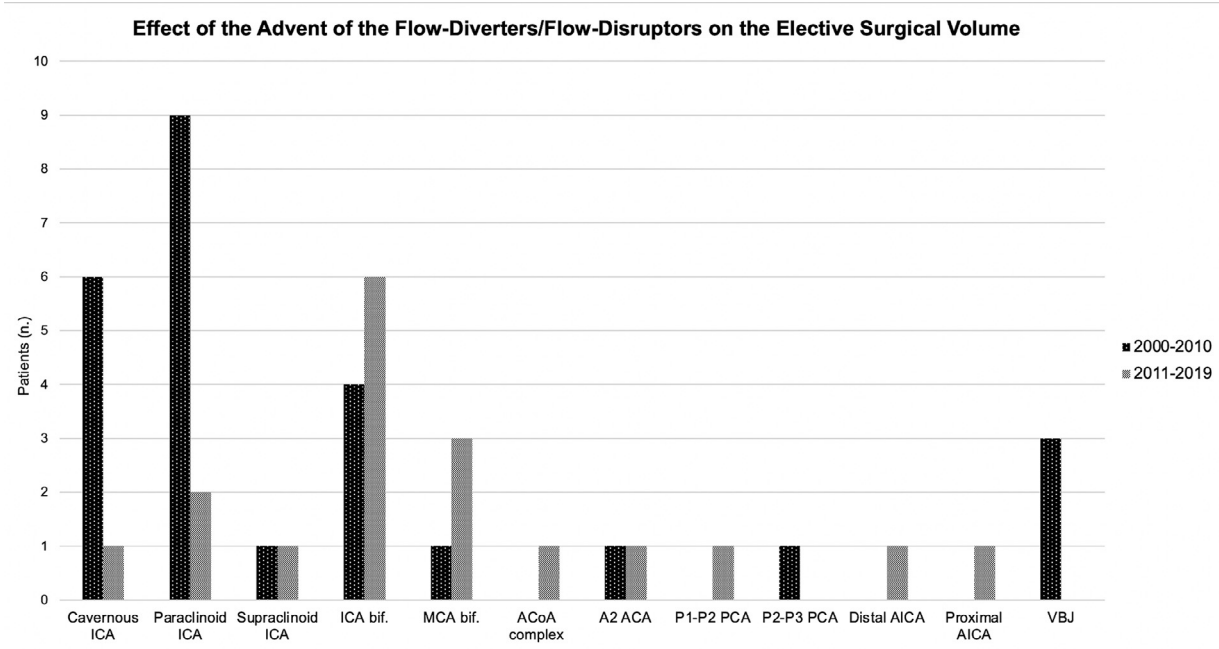
Graph. 2. Bar graph showing the prevalence of the different surgical techniques used.



Graph. 3. Bar graph illustrating the incidence of complications in the present series according to type and decades.



Graph. 4. Bar graph about the overall outcome in ruptured and unruptured aneurysms.



Graph. 5. Bar graph documenting the shift toward endovascular therapy for specific sites of giant aneurysms across the decades after the advent of flow-diverters/flow-disruptors.

technique led to definitive aneurysm exclusion. Postoperative digital subtraction angiography DSA confirmed complete occlusion, and the patient was discharged with no deficits (**Video 1**). The second case concerns an 18-year-old male who, after two consecutive and tight sentinel headaches, was diagnosed with a giant paraclinoid Barami type Ib [2] ICA aneurysm having a tumor-like growth with a severe mass effect. A contralateral smaller unruptured supraclinoid ICA bifurcation aneurysm was also present. The giant aneurysm was treated for the first time, and accordingly, a right cranio-orbito-zygomatic approach, extracranial to intracranial high-flow bypass with a saphenous vein graft, and aneurysm trapping was performed. Despite no intraoperative complications, the patient suffered severe neurological deterioration and left hemiparesis secondary to the occurrence of a massively delayed aneurysm thrombosis. After decompressive craniectomy, the neurological exam improved up to an mRS3. DSA confirmed the complete exclusion of the right aneurysm and bypass patency. Eight months later, the left aneurysm was successfully embolized (**Video 2**).

2. Experimental Design, Materials and Methods

The patients in the present series were surgically treated in two tertiary referral Italian hospitals for GIA. They were retrospectively selected from a prospectively maintained database. Clinical data, neuroimaging studies, surgical videos, follow-up, and outpatient data were reviewed and are reported herein. Furthermore, our data were compared with the main surgical and endovascular series reported in the literature [3-8].

Three-dimensional CT angiography and 6-vessel DSA were performed in all cases. A balloon test occlusion (BTO) was performed in every GIA originating from the ICA. Our BTO protocol involved inflation of a 5-Fr balloon catheter in the cervical segment of the ICA via standard transfemoral access. Muscle strength, sensation, cognition, and cranial nerve function were tested before and after the intravenous injection of Labetalol bolus (200 mL; 1 mg/mL in 2 min). Systolic blood pressure was lowered by 10% to 15% from baseline for 20 min to assess whether neurologic examination worsened after the induction of hypotension. Elective patients also underwent magnetic resonance imaging to detect the presence of intrasaccular thrombi. In all ACoA and paraclinoid ICA aneurysms, visual field testing was performed regardless of the history of visual symptoms. Patients for whom a bypass was planned or unplanned but potentially necessary in case of failure of direct treatment were given aspirin (325 mg/day) or clopidogrel (150 mg/day) in case of contraindication for aspirin, the day before surgery. Furthermore, the sites of anastomosis and harvesting of the graft were marked and draped in preparation for either scenario. If the bypass was performed, antiplatelet therapy was continued for 6 months postoperatively. Somatosensory and motor evoked potentials were employed in all cases, in addition to brainstem auditory-evoked potentials for posterior circulation GIAs.

Protocols regarding BTO, neuromonitoring, and intraoperative advanced blood flow visualization techniques, indocyanine green and fluorescein videoangiography (Kinevo 900, IR800 and YELLOW560 integrated filters, Carl Zeiss, Oberkochen, Germany) used in these cases (the latter employed only in the last three years) were described by our group for other surgical neurovascular pathologies [9-17]. Clinical outcomes were evaluated using the mRS score [18] at the 6-month follow-up. Good overall outcome, moderate disability, severe disability, and dead/vegetative state were assigned to an mRS of 0-2, 3, 4-5, and 6, respectively. Immediate and overall angiographic outcomes were assessed with postoperative and 6-months DSA, respectively. All patients, but those in the vegetative state, underwent yearly CT angiography. In the case of angiographic revealed evidence of incomplete occlusion of the aneurysm, further management steps were taken on a case-by-case basis. Additionally, for paraclinoid ICA, ACoA, and proximal ACA aneurysms, visual outcomes were evaluated with visual field testing 6-months after the last surgery.

Differences in outcome between anterior and posterior circulation as well as ruptured and unruptured GIAs were tested using a Chi-squared test where a $p < 0.05$ was considered significant. Because flow-diverters and flow disruptors were implemented in both hospitals at the end

of 2010 and October 2016, respectively, data were further divided into two different decades (from 2000 to 2010 and 2011–2019) to precisely evaluate the effects of implementing these devices on the global surgical volume.

Ethics Statement

We obtained informed consent for the study and publication from all patients or their families. All the images have been anonymized.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

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Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.dib.2020.106537](https://doi.org/10.1016/j.dib.2020.106537).

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