

Surgical Management of Aneurysms in Senegal: A 10-Year Review of Patient Demographics, Clinical Features, and Treatment Outcomes

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INTRODUCTION

- Aneurysmal subarachnoid hemorrhage (aSAH) is a neurologic emergency with global mortality approaching 50% and substantial long-term disability among survivors.
- In high-income countries, outcomes have improved with early diagnosis and advanced neurocritical care, while low- and middle-income countries (LMICs) rely primarily on microsurgical clipping due to limited infrastructure and interventional capacity.
- In Senegal, neurosurgical density is 0.19 per 100,000 (2025), compared with a global average of 0.93, and Fann Teaching Hospital performs nearly all aneurysm surgeries.
- A 2018 series of 102 ruptured aneurysms treated with microsurgical clipping at Fann Teaching Hospital reported 65% favorable outcomes and 12.7% perioperative mortality.
- This study analyzes a 10-year retrospective cohort of microsurgical clipping at Fann Teaching Hospital to define aneurysm characteristics, operative outcomes, and functional recovery, establishing benchmarks for resource-constrained settings.

METHODS

- **Study Design:** Retrospective cohort study of patients undergoing microsurgical treatment for intracranial aneurysms at Fann Teaching Hospital (Dakar, Senegal) between January 2013 and December 2024.
- **Participants:** Included all surgically treated aneurysm cases; including non-surgical management and charts with incomplete procedural or outcome data.
- **Data Collection:** Extracted demographics, clinical presentation, comorbidities, aneurysm morphology and location, operative techniques, timing metrics, and hospital length of stay.
- **Statistical Analysis:** Used descriptive statistics and univariate analyses comparing clinical, radiographic, and operative variables; employed non-parametric tests with Bonferroni correction, and calculated effect sizes using Cliff's delta
- **Outcomes:** Primary outcome was functional status measured by the modified Rankin Scale at discharge, 1 month, 6 months, and final follow-up; secondary outcomes included complications, intraoperative rupture, and mortality

FIGURES

Figure 3. Radiological and morphological characteristics of intracranial aneurysms. **Panel A:** Distribution of Fisher grades on initial CT. **Panel B:** Aneurysm size stratified by maximal diameter. **Panel C:** Morphological classification of aneurysms. **Panel D:** Radiological complexity indicators. **Panel E:** Documented etiologies. **Panel F:** Lesion count per patient.

Figure 5. Clinical outcomes and complications in patients with aneurysmal subarachnoid hemorrhage. **Panel A:** Complications rates. **Panel B:** Mortality mortality analysis. **Panel C:** Functional outcomes at discharge **Panel D:** Outcome evolution over time

RESULTS

- **Study and Patient Characteristics:** Among 581 surgically treated patients (2013–2024), cases clustered in the last decade (median year 2020), with a predominantly female cohort (69%) and mean age 48.0 ± 14.4 years
- **Clinical and Paraclinical Symptoms:** Headache was nearly universal (99%); hypertension was the most common comorbidity (54.9%), while hereditary and infectious risk factors were rare
- **Radiological and Morphological Profile:** Severe hemorrhage predominated, with Fisher grade 3–4 in 74.5%; most aneurysms were solitary (74.4%), saccular (94.5%), anterior circulation (76.2%), and <10 mm (83.9%)
- **Operative Metrics and Treatment Modalities:** Microsurgical clipping was the primary treatment (95.3%), median operative duration was 215 minutes, and intraoperative rupture occurred in 16.0%; operative time differed significantly by technique ($p < 0.001$)
- **Postoperative Events and Outcomes:** Complications included neurological deficits (18.1%), ischemia (12.0%), postoperative hematoma (11.0%), hydrocephalus (10.2%), and vasospasm (9.8%), with in-hospital mortality of 11.4%; favorable functional outcome (modified Rankin Scale ≤ 2) increased from 64.2% at discharge to 79.5% at 1 month, 86.0% at 6 months, and 80.1% at final follow-up, with late rebleeding rare (0.2%)
- **Planned Univariate Analysis:** Ongoing univariate comparisons will evaluate associations between demographic, clinical, radiographic, and operative variables and functional outcomes, complications, and mortality. May involve several analysis so will most likely need more space than I have allotted here. I will revisit and make more room for analysis if needed.

DISCUSSION

- This large single-center cohort shows a high initial disease burden, with high-grade hemorrhage and heavy reliance on microsurgical clipping, yet functional outcomes comparable to other Sub-Saharan African series
- Beyond hypertension, anemia and electrolyte disturbances affected nearly one-fifth of patients, representing actionable perioperative targets linked to vasospasm and poorer outcomes in aneurysmal subarachnoid hemorrhage
- Operative duration varied significantly by technique, reflecting procedural complexity rather than inefficiency and underscoring the importance of operative time benchmarking for surgical planning
- Most patients followed a predictable care trajectory, with admission within one week, surgery by the second week, and discharge by week three, supporting a feasible care model in resource-limited settings
- Despite intraoperative rupture and postoperative complications, severe adverse events were uncommon, with substantial functional recovery, durable aneurysm exclusion, and rare late rebleeding
- The predominance of anterior circulation, small-to-medium saccular aneurysms suggests that case selection and surgical expertise strongly influence outcomes even without endovascular access, highlighting the value of centralized neurovascular care
- **Planned Univariate Analysis:** Ongoing univariate comparisons will assess associations between demographic, clinical, radiographic, and operative variables and functional outcomes, complications, and mortality
- **Limitations:** This study was limited by variable documentation and incomplete long-term follow-up, which may affect outcome precision and generalizability.
- **Conclusion:** Microsurgical clipping at a national referral center achieved acceptable complication rates and sustained functional recovery, providing critical benchmarks for neurovascular care planning and quality improvement in resource-constrained settings.