

Publication Brief

Clinical and Radiological Outcomes of Intracranial Aneurysm Clipping Aided by Transit Time Flowmetry

RHGJ Van Lanen *et al*, Dept. of Neurosurgery, Maastricht Univ. Medical Center, Maastricht, The Netherlands.

Background:

Ever since the International Subarachnoid Aneurysm Trial coiling has been favored over clipping for intracranial aneurysms. This has resulted in increasingly complex aneurysm configurations that are relegated for clipping. At our institution, a multidisciplinary team (neurologist, neurosurgeon, and interventional radiologist) determines whether an aneurysm should be coiled (the preferred treatment) or clipped.

Objective:

To present the outcomes of clipping of aneurysms not suitable for coiling, with monitoring of intraoperative flow by transit time flowmetry technology.

Methods:

- Study included 190 patients with 213 aneurysms from a total of 239 patients with 274 aneurysms;
- Patients were stratified by unruptured aneurysms (H&H grade 0) and ruptured aneurysms causing a SAH (H&H grade 1-5), along with other characteristics.
- Median time from SAH to clipping was 2 days and 70.8% of patients underwent clipping within 3 days after detection of SAH.
- Flow was measured with the Charbel MicroFlowprobe in all major vessels before and after aneurysm clipping (branches directly distal of the clip and all branches at risk of being compromised during clip placement).
- The clip was repositioned when flow in the measured artery was <50% after clipping compared with before (baseline flow), or in the presence of an aneurysm remnant due to suboptimal clip positioning.
- Blood pressure, HR, partial pressure of CO₂, temporary clipping, operation time, and possible aneurysm rupture were recorded.
- Intraoperative arterial blood flow was assessed in relation to postoperative ischemia and unfavorable outcome.
- Radiological occlusion rate was assessed at 6 months and 1 year after surgery. 92.0% (196 of 213) of aneurysms had postoperative imaging by DSA (68.2%) and/or CTA (52.6%) to assess obliteration.

Results:

- Imaging showed a total obliteration of the aneurysm in 86.7% of cases. Complete aneurysm occlusion was achieved significantly more often in the H&H grade 0 group compared with the H&H grade 1-5 group (95.7% vs. 81.9%; $P = 0.007$).
- Mortality at 1 year was 7.9%, with a 21.6% rate of an unfavorable outcome.
- 96.1% of patients with unruptured aneurysms had an favorable outcome at 1 year, compared with 71.9% of patients with SAH.
- Postoperative computed tomography imaging showed an 86.7% occlusion rate and a 7.5% rate of clip-related ischemia.
- Clip reposition aided by transit time flowmetry resulted in restored flow >50% above baseline flow in 85.7% of aneurysms. Less than 50% flow from baseline was an independent predictor of unfavorable outcome, along other risk factors.
- Rebleeding after clipping occurred in 2.3% aneurysms (5 of 213), at an average of 4 months after surgery. Four of these patients had an unfavorable outcome at 1 year. In one patient, clipping was suboptimal and additional postoperative endovascular coiling failed, and rebleeding occurred.
- Flow <40% of baseline significantly predicted clip-related ischemia (odds ratio **[OR]**, 5.14; 95% confidence interval **[CI]**, 1.41-8.4; $P = 0.012$).

Conclusions:

- Positive results for these challenging aneurysms were shown, aided by transit time flowmetry as a valuable tool, providing quantitative measurements of arterial blood flow to help achieve optimal clip placement and minimizing aneurysm residuals that may be sites of rebleeding.
- Adequate flow, defined as $\geq 50\%$ of baseline, greatly reduces the risk of unfavorable outcome.

Reference

Van Lanen RHGJ, Jacobi-Postma LAA, Veersema TJ, Teernstra OPM, Dings JTA, "Clinical and Radiological Outcomes of Intracranial Aneurysm Clipping Aided by Transit Time Flowmetry," *World Neurosurg*. 2020;136:e660-e670. (Transonic Reference # NS11826AH)