Publication Brief

Multimodal Flow-Assisted Resection of Brain AVMs

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OBJECTIVE
To report the intraoperative findings and clinical outcomes of a mutimodal flow-assisted technique in the resection of 27 patients treated for cerebral arteriovenous malformations (AVMs).

METHODS
Data from 27 patients with AVMs, 21 of whom had ruptured AVMs were retrospectively analyzed. The surgical strategy was guided by flow data provided by a combination of three techniques according to the phase of resection and the issue of the moment.

- ICG-VA was performed 97 times: 27 before dural opening, 27 after dural opening and before resection, 16 times during dissection, and 27 times at the end of resection.

- The Charbel Micro-Flowprobe was used a total of 221 times on 97 vessels: 92 times before resection in all 27 patients, after ICG-VA, on both cortical feeders and venous drainages; 104 times during resection in 26 patients; and 25 times in 22 patients at the end of resection to check residual flow.

- Intraoperative clipping test was used 21 times in 14 patients to assess the functional importance of vessels involved with the AVM to distinguish between AVM feeders and transit arteries and to reduce post-operative neurological deficits.

RESULTS
- ICG-VA clearly showed the AVM angio-architecture in 21 cases after dural opening; it did not in 6 cases.

- Intraoperative flow measurements were able to distinguish between arterial feeders and venous drainages in every case. It helped understand AVM angio-architecture to guide surgical planning. During dissection, it helped differentiate between deep arterial feeders and venous drainages not exposed at the beginning of resection. After resection, flowmetry revealed residual nidus missed at surgical dissection.

- Re-operation for residual nidus was needed in one case (3 %).

- Average mRS change 1 month after surgery was +0.02.

CONCLUSION
The multimodal AVM flow-assisted approach was safe, feasible and reliable to achieve AVM resection with a high radical resection rate, lack of intraoperative complications and low morbidity.

DISCUSSION
The Padua surgeons found that the multimodal flow-assisted approach was complementary and enabled them to shift from one modality or another, according to the stage of resection, AVM location, or specific issues that needed to be addressed.
- Before resection, ICG-VA and flowmetry showed AVM angio-architecture and guided surgical strategy;
- The temporary arterial clipping-test was 100 % sensitive in differentiating between an AVM feeder and a transit artery to the sensi-motor area.
- During final resection, flowmetry was more effective than ICG-VA in detecting a missed residual nidus.

REFERENCES
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THE MEASURE OF   BETTER RESULTS.