

IN PRACTICE: Ultrasonic aspiration combined with IONM – tumor resection near a functional white matter tract



Expert opinion and practical experience

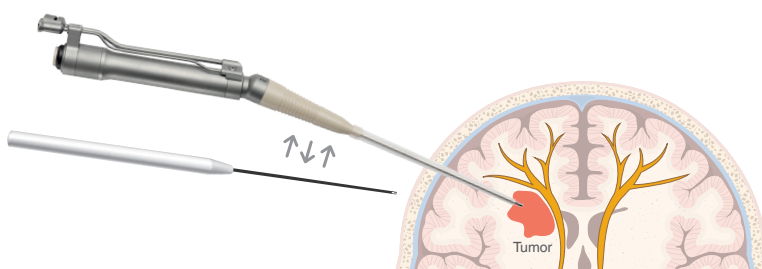
This expert opinion and practical experience has been created by Pr Shahan Momjian, Senior Staff Neurosurgeon, PD, Hôpitaux Universitaires de Genève, Switzerland



Dynamic continuous mapping

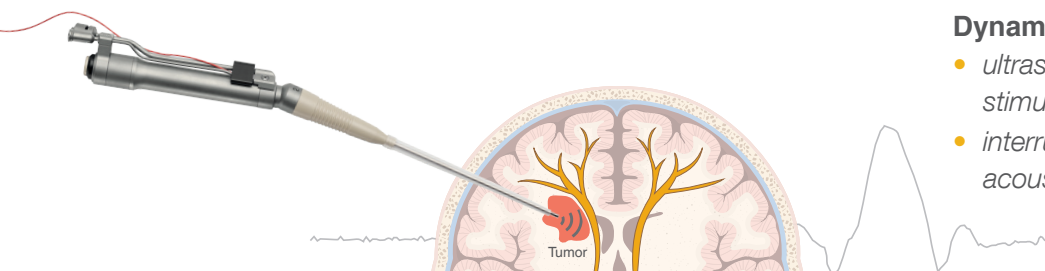
The resection of intrinsic brain tumors is a common procedure in neurosurgery. When the tumor is located near or within highly functional cerebral regions, electrophysiological mapping and monitoring of these regions becomes crucial to minimize the risk of postoperative neurological deficits. This is particularly the case in the subcortical regions, where dynamic continuous subcortical mapping is successfully applied, notably for the preservation of the motor tract. To address this challenge with a maximized clinical outcome, two technologies were combined: ultrasonic aspiration and intraoperative neuromonitoring (IONM).

Comparison between »dynamic mapping« and »dynamic continuous mapping«*



Dynamic mapping

- separate monopolar stimulation probe used
- tumor resection is temporarily interrupted when the tissue is stimulated



Dynamic continuous mapping

- ultrasonic aspirator is resection and stimulation device
- interruption-free workflow, continuous acoustic feedback is given

* These benefits are associated with dynamic continuous mapping by inomed as stated in the information material: Dynamic mapping of the corticospinal tract: instrument choice, D030166 EN

Advantages of dynamic continuous mapping

- + *Improved ergonomics: Combined tools minimize the change of instruments.*
- + *Minimized movement: The tip of the ultrasonic aspirator is already on the tissue to be mapped and potentially removed directly thereafter – no additional gesture needed.*
- + *Increased safety: Dynamic continuous mapping of a critical area can provide earlier feedback to stop the resection.*

Indications of dynamic continuous mapping

The ultrasonic aspirator combined with the stimulation mapping can be used for:

- *resection of intrinsic brain tumors which are located close to a functional white matter tract*
- *removal of vestibular schwannomas*

Procedure for intrinsic brain tumor in a motor region

When approaching a potentially motor region, stimulation mapping is started with an initial stimulation intensity of 12 mA. Once motor responses are evoked, the amplitude of stimulation is decreased by increments of 1 mA aiming at detecting the motor threshold.

Once the initial threshold is chosen, stimulation mapping can be performed while resecting the tumor, either by alternating phases of mapping with phases of resection or by continuously mapping during the resection. Depending on the stage of resection, on the proximity with the functional tracts and on the desired safety margin, the motor threshold can be dynamically decreased further and the frequency of the stimulation trains increased (up to two per second).

Hint: The described procedure is not directly applicable for the removal of vestibular schwannomas.

How to use it correctly

On the monitoring system, sounds of different pitches may be used to indicate the location of the evoked motor responses (e.g. low to high pitch for lower limb to face). A good communication with the electrophysiologist is mandatory. This is especially important when performing dynamic continuous mapping at the lowest desired motor threshold in order to immediately stop the resection if a response is evoked.

Electrophysiology

Installation of the system for monopolar stimulation using an ipsilateral body electrode as the return electrode; parameters of stimulation: train of five biphasic charge-balanced pulses (0.4 ms per phase, interpulse interval of 2 ms).

What to consider

Avoid the contact of the metallic handle of the sonotrode with the scalp while stimulating as the electrical current would re-enter the body at that point (and not at the tip), which can lead to a falsely negative response. As during surgery, the ultrasonic aspirator becomes mentally the effector of the surgeon's strategy in pushing to the limit between maximal extent of resection and safety, using a unique tool for removing and preserving appears sensible.

References:

Boëx C, Goga C, Bérard N, Haemmerli J, Zegarek G, Bartoli A, Momjian S, Schaller K. Introduction of a novel connection clip for the ultrasonic aspirator for subcortical continuous motor mapping. *Brain Spine* 2021; 1: 100002. doi: 10.1016/j.bas.2021.100002

For more information about the intraoperative neuromonitoring system, please contact inomed Medizintechnik GmbH. For more information about the ultrasonic aspiration, please contact Söring GmbH