# Awake craniotomy indications

1. surgery in the eloquent brain (near motor strip (Brodmann's area 4 ) or speech/language centers or thalamus) including tumors and epileptic foci

2. removal of brainstem tumors

3. some seizure surgery to look for seizure focus

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see Awake surgery in pediatric patient.

seer Awake epilepsy surgery.

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Awake craniotomy is most commonly performed in the resection of brain tumours near the sensitive cortex areas and in epilepsy surgery, allowing functional mapping [1].

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Gross total removal of glioma is limited by proximity to eloquent brain. Awake surgery allows for intraoperative monitoring to safely identify eloquent regions.

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For a long time, the right hemisphere (RH) was considered as "non-dominant", especially in right-handers. In neurosurgical practice, this dogma resulted in the selection of awake craniotomy with language mapping only for lesions of the left dominant hemisphere. Conversely, surgery under general anesthesia (possibly with motor mapping) was usually proposed for right lesions. However, when objective neuropsychological tests were performed, they frequently revealed cognitive and behavioral deficits following brain surgery, even in the RH. Therefore, to preserve an optimal quality of life, especially in patients with a long survival expectancy (as in low-grade gliomas), awake surgery with cortical and axonal electrostimulation mapping has recently been proposed for right tumors resection. Here, we review new insights gained from intraoperative stimulation into the pivotal role of the RH in movement execution and control, visual processes and spatial cognition, language and non-verbal semantic processing, executive functions (e.g. attention), and social cognition (mentalizing and emotion recognition). Such original findings, that break with the myth of a "non-dominant" RH, may have important implications in cognitive neurosciences, by improving our knowledge of the functional connectivity of the RH, as well as for the clinical management of patients with a right lesion. Indeed, in brain surgery, awake mapping should be considered more systematically in the RH. Moreover, neuropsychological examination must be achieved in a more systematic manner before and after surgery within the RH, to optimize the care by predicting the likelihood of functional recovery and by elaborating specific programs of rehabilitation [2].

### Operations in eloquent areas

Awake craniotomy was introduced for surgical treatment of epilepsy, and has subsequently been used in patients with supratentorial tumors, intracranial arteriovenous malformation, deep brain stimulation, and mycotic aneurysms near critical regions of brain.

Patients are selected for awake craniotomy when the planned procedure involves eloquent areas of the brain, necessitating an awake, cooperative patient capable of undergoing neurocognitive testing, especially speech area, (Broca's area, Wernicke's area) near motor strip, thalamus, removal of brainstem tumors, some seizure surgery.

The critical issue is to set aside enough time to identify eloquent cortices by electrocortical stimulation (ECS). High gamma activity (HGA) ranging between 80 and 120 Hz on electrocorticogram (ECoG) is assumed to reflect localized cortical processing. In this report, we used realtime HGA mapping and functional magnetic resonance imaging (fMRI) for rapid and reliable identification of motor and language functions. Three patients with intra-axial tumors in their dominant hemisphere underwent preoperative fMRI and lesion resection with an awake craniotomy. All patients showed significant fMRI activation evoked by motor and language tasks. After the craniotomy, we recorded ECoG activity by placing subdural grids directly on the exposed brain surface. Each patient performed motor and language tasks and demonstrated realtime HGA dynamics in hand motor areas and parts of the inferior frontal gyrus. Sensitivity and specificity of HGA mapping were 100% compared to ECS mapping in the frontal lobe, which suggested HGA mapping precisely indicated eloquent cortices. The investigation times of HGA mapping was significantly shorter than that of ECS mapping. Specificities of the motor and language-fMRI, however, did not reach 85%. The results of HGA mapping was mostly consistent with those of ECS mapping, although fMRI tended to overestimate functional areas. This novel technique enables rapid and accurate functional mapping [3)].

## Awake surgery for glioma

Awake surgery for glioma

## Awake surgery for arteriovenous malformation

Awake surgery for arteriovenous malformation.

## Contraindications

Uncooperative (very young or too old patient).

Confusion.

Speech deficit

Language barrier

### Brain mapping

Electrocortical stimulation (ECS) is the gold standard for functional brain mapping during an awake craniotomy.

Awake craniotomy could be challenging because of unsecured airway with risks of vomitting, epileptic attacks or unstable level of consciousness. It is considered that the patient monitoring becomes more difficult when iMRI is performed because the patient's face cannot be obsereved directly. We should remember that conscious level as well as respiration pattern may change during operation [4].

Awake craniotomy can be safely performed in a high-field (1.5 T) iMRI suite to maximize tumor resection in eloquent brain areas with an acceptable morbidity profile at 1 month [5].

The routine use of fMRI was not useful in identifying language sites as performed and, more importantly, practiced tasks failed to prevent neurological deficits following awake craniotomy procedures [6].

## Awake surgery for insular glioma

see Awake surgery for insular glioma.

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