Connectome-guided resection

Connectome-guided resection is a neurosurgical technique that utilizes brain connectivity data to guide the removal of brain tumors or epileptic foci. The connectome is a map of the neural connections in the brain, and this information can be obtained through advanced brain imaging techniques such as diffusion tensor imaging (DTI).

With connectome-guided resection, surgeons use the connectome data to identify the neural pathways that are critical for specific brain functions such as speech, vision, and motor function. This helps them to plan the surgical approach and minimize the risk of damaging important neural pathways during the procedure.

The technique has shown promising results in several studies, as it can improve surgical outcomes and reduce the risk of neurological deficits caused by surgical damage to critical brain areas. Additionally, connectome-guided resection can be used to identify epileptic foci that are located in the vicinity of critical neural pathways, which can help to minimize the risk of postoperative neurological deficits while achieving optimal seizure control.

Overall, connectome-guided resection is an exciting development in the field of neurosurgery that has the potential to significantly improve patient outcomes and reduce the risk of postoperative complications.

Early maximal tumor removal results in greater survival in both high-grade and low-grade gliomas, leading to propose “supra-marginal” resection, with excision of the peritumoral zone in diffuse neoplasms. To minimize functional risks while maximizing the extent of resection, traditional “tumor-mass resection” is replaced by “connectome-guided resection” conducted under awake mapping, taking into account inter-individual brain anatomo-functional variability. A better understanding of the dynamic interplay between DG progression and reactional neuroplastic mechanisms is critical to adapt a personalized multistage therapeutic strategy, with integration of functional neurooncological (re)operation(s) in a multimodal management scheme including repeated medical therapies. Because the therapeutic armamentarium remains limited, the aims of this paradigmatic shift are to predict one/several step(s) ahead glioma behavior, its modifications, and compensatory neural networks reconfiguration over time in order to optimize the onco-functional benefit of each treatment - either in isolation or in combination with others - in human beings bearing a chronic tumoral disease while enjoying an active familial and socio-professional life as close as possible to their expectations. Thus, new ecological endpoints such as return to work should be incorporated into future DG trials. “Preventive neurooncology” might also be envisioned, by proposing a screening policy to discover and treat incidental glioma earlier [1)]

1)

Duffau H. Oncological and functional neurosurgery: Perspectives for the decade regarding diffuse gliomas. Rev Neurol (Paris). 2023 Mar 10:S0035-3787(23)00861-5. doi: 10.1016/j.neurol.2023.01.724. Epub ahead of print. PMID: 36907710.