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Surgery of insular and paralimbic diffuse low-grade gliomas: Technical considerations

Aim: Once considered a “no man’s land” especially when invaded by a diffuse low grade glioma (DLGG), the insula/paralimbic system remains today a surgical challenge. Surgery for insular/paralimbic DLGG involves consideration of its hidden location under the potentially eloquent operculae, the proximity to vascular tree and high density of functions not only in the insular cortex but also in the white fiber pathways passing under the insular lobe. Here, a personal consecutive series of 150 patients who underwent an insular/paralimbic DLGG revealed by seizures, with long-term follow-up, is detailed. Based upon functional and oncological results, advances and limitations of this challenging surgery are discussed.

Methods: The preoperative examination was normal in 88% of patients. All surgeries were performed under cortico-subcortical stimulation, in 134 patients while awake. A transopercular approach was favored, even in pure insular DLGG. Despite an immediate postoperative worsening in 59% of cases, all patients but two (98%) returned to baseline or better. On control MRI, 80% of resections were total or subtotal. 15 patients underwent a second or third surgery, with no additional deficit. 82% of patients are still alive with a mean follow-up of seven years.

Conclusions: This is the largest series ever reported with insular/paralimbic DLGG surgery. The better knowledge of the functional anatomy and the connectivity of the insula as well as the use of intraoperative direct stimulation mapping enabled to minimize the risk of permanent deficit (and even to improve the quality of life) while increasing the extent of resection; thus, the impact on the natural history. Therefore, surgical removal has to be considered systematically for insular/paralimbic DLGG. However, this surgery remains challenging, especially within the anterior perforating substance and the posterior part of the (dominant) insula. Repeated operations can be suggested when the first resection was not complete.

Biography

Hugues Duffau is a Professor and Chairman of Neurosurgery department at Montpellier University Medical Center and Head of the INSERM 1051 Team “Plasticity of the central nervous system, human stem cells and glial tumors” at Institute for Neurosciences of Montpellier (France). He is an expert in the awake cognitive neurosurgery of slow-growing brain tumors, as low-grade gliomas, a routine which he has developed since 20 years. His fundamental approach is centered on the concepts of the brain connectomics and neuroplasticity, breaking with the traditional localizationist view of cerebral processing. He has written four textbooks and over 335 publications in international journals ranging from neurosurgery to fundamental neurosciences, including cognitive sciences and brain plasticity for a total of more than 20,500 citations and with an h-index of 77. He is member of editorial boards of many journals and Reviewer for around 100 journals including: New England Journal of Medicine, Lancet Oncology, Nature Medicine, Nature Reviews Neuroscience, Nature Reviews Neurology, Annals of Neurology, Brain, Cerebral Cortex, Trends in Cognitive Science, and Current Biology, etc. He is a member of the French Academy of Medicine, member of the French Academy of Surgery and member of the World Academy of Neurological Surgery, etc.

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